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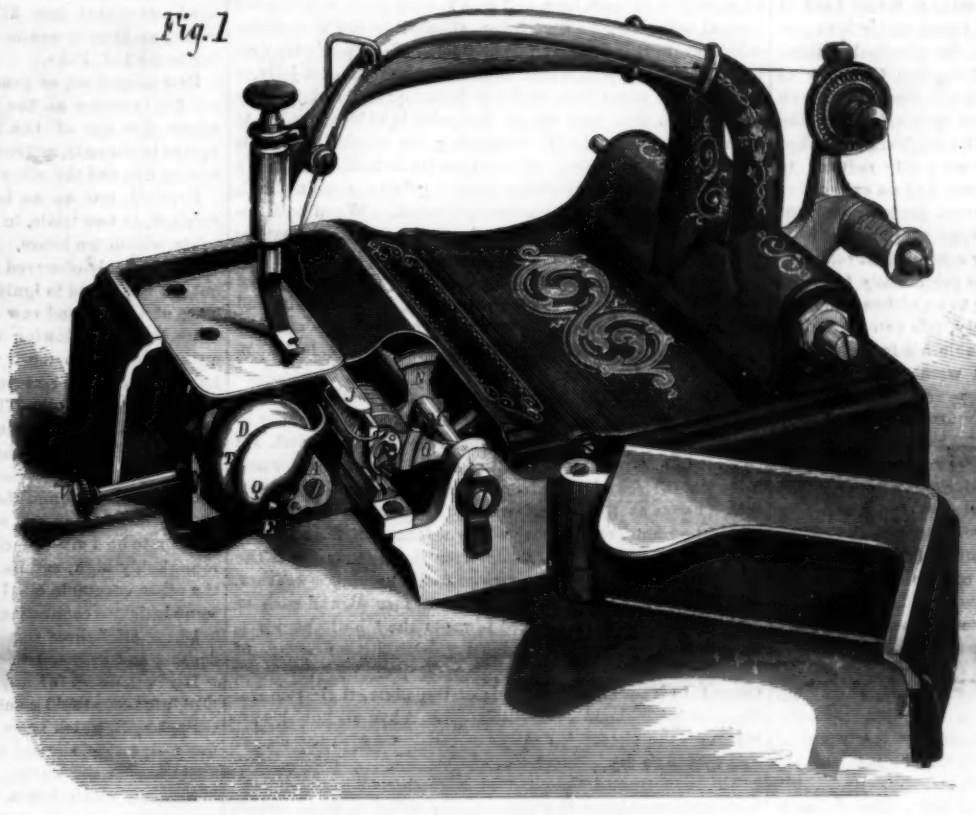
IMPROVED SEWING MACHINE.

We lay before our readers a new form of a well known household convenience which, for the novel movements it comprises, is worthy of a careful examination from all interested, in the development of the sewing machine in particular and in ingenious pieces of mechanism in general. The special point of advantage which distinguishes this device is that it obviates the necessity of bobbin and shuttle and the consequent tedious rewinding of the thread from the spool, thus allowing the latter to be placed immediately in the machine. Either a single thread, forming a chain stitch, or two threads, making a lock or a combined lock and chain stitch, may be employed. Such are the general capabilities of the invention; how its work is done, and with the aid of what effective though simple appliances, we now proceed to explain.

The large engraving, Fig. 1, represents the machine in perspective, and also shows how the covering is hinged to the main portion so as to be thrown back and to one side, in order to admit of inspection or oiling of the working parts. Figs. 2, 3, and 4 are views of the principal portions in detail, to which we shall refer as we advance. The needle is mounted on the vibrating arm, as shown, the latter communicating with a rocker which is worked by a short crank shaft, which in turn, by suitable arrangements, is moved by the main pulley. The looper, A (Fig. 2) is a long curved finger pivoted to the frame of the machine nearly under the needle. At its upper end, C, it has a large curve, the outer face of which is grooved. The right hand extremity of this portion is a sharp hook which, as shown in Fig. 2, first engages the thread passing between the same and the eye of the needle as the latter descends. The thread falls into the groove of the curved portion, C, and is carried away to the right of the needle. D is a rotating plate, to which is attached the revolving looper, E, Figs. 2 and 3, the front end of which is notched. This looper, E, comes down upon the thread after it has been engaged by the looper, A, catches it and draws

Fig. 1



LATHROP'S SEWING MACHINE.

Fig. 2.

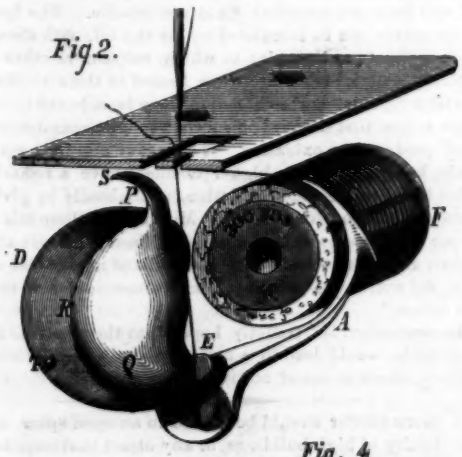
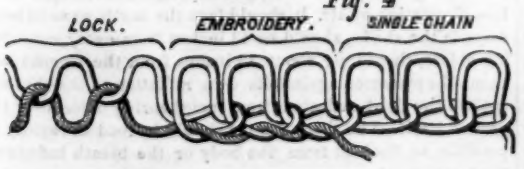


Fig. 4



it downward nearly in a direct line from the point of the needle. The position of the thread, looper, E, and looper, A, is shown in Fig. 2. The looper, A, is here represented at the end of its path, having been actuated by an ingenious combination attached to the horizontal shaft to which the plate, D, is affixed, as in Fig. 3 It will be seen that the thread (Fig. 2) is opened out in the form of a triangle. Another portion of the device now comes into action. This is the spool carrier, which transports the under spool bodily through the triangle of thread, thus leading through the thread that locks the stitch. In Fig. 4, showing the parts from above, F is the spool, placed on a spindle in the spool carrier, G, of which a perspective view is represented in Fig. 1. A thumbscrew, H, in the carrier holds the spindle in place in the two end pieces, and also serves to regulate the tension of the locking thread. The lower side piece of the carrier is fitted to work in the guide ways, I, and the upper side piece, J, traverses similar guide ways (Fig. 3). The looper, A, carrying the upper thread, passes through a notch in the upper guide ways and through an opening between the lower ones. The bar, K, is perforated with a small hole, which acts as a guide for the under thread.

In order to move the carrier, G, with its spool through the triangle of thread without its coming in contact with the same, a driver, L, is employed, connecting with the ends of the carrier. This driver has both a reciprocating and an oscillating motion, the former to transport it back and forward in its path, the latter to turn it on its axis to make the necessary connections and disconnections. The first movement is obtained through simple mechanical arrangements acting on an arm attached to the driver and worked by the motive power of the machine. The second is gained in connection with the above by causing the driver to traverse the fixed spiral way, M, so that it is necessarily rotated a certain distance of arc. To the driver are attached the arms, N and O, Fig. 3. These arms are adjusted at nearly right angles to each other, and on their outer curved edges are grooves which engage in the end pieces of, and thus impart motion to, the carrier. As they are at right angles, it is evident that but one arm can be in action at a time. In Fig. 3, the arm, N, is shown disengaged; consequently the carrier can pass along to the left over the looper, A, clearing the thread on the latter by means of the opening between the carrier and the arm, N. But the driver begins to oscillate, and by the time the arm, O, shown connected in Fig. 3, reaches the triangle of thread it becomes disengaged, while meanwhile the arm, N, again comes into action, and continues to impart motion to the carrier. The consequence of the disconnection of the arm, O, is an opening between it and the carrier through which the thread passes. During these movements, the lower spool, unwinding, leaves its locking thread lying through the triangle.

Next, the looper, A, swings back its thread to the notch, P. The looper, E, meanwhile continues to hold the thread. The return movement of the looper, A, necessarily causes a slackening which is liable to kink or become entangled. Therefore the plate, Q, is employed so as to engage what was the lower side of the triangle of thread in a guide groove at R (Fig. 2), and to hold the slack until the notch, P, comes, in its upward course, nearly to the needle. The groove, R, then vanishes in the face of the plate, and the loop escapes from it, over the bulged portion of the plate, D, and slides up to the horn, S, whence it finally passes to the fabric. The looper, A, arrives back to the left, ready to take another thread at the time the notch, P, engages the thread, and is going out with the new loop, while the old loop is being cast out of the guide groove, R. As the looper is taking the new loop, the spool carrier travels back to its former position.

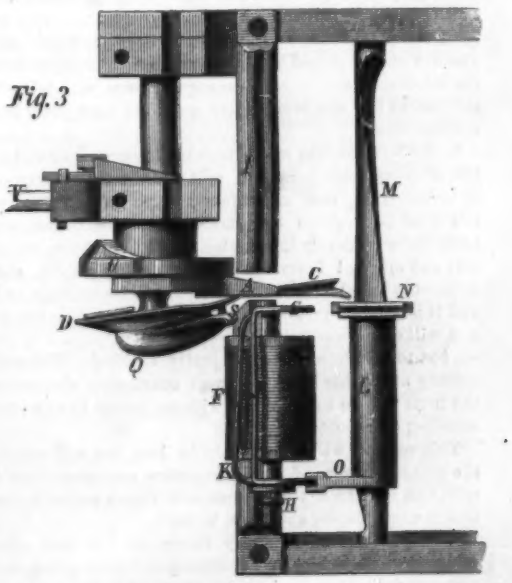
These operations form the lock stitch. To make a chain stitch, the pin, T, is employed, which is thrust through the plate, D, to engage the thread after it drops into the notch, P, and to carry it forward to the right of the needle; so that the latter will come down through the loop thus formed, and deliver the thread to the looper, A, in a manner that, when the old loop is cast off, it will be over the new loop. The chain stitch requires only the single upper thread; but if it be desired to make a combined lock and chain stitch, the pin, T, can still be used and does not interfere with the motions before described. The pin, T, is provided with suitable arrangements by which it can be shifted in or out of working position.

The feed motion is actuated by a spiral spring attached to the frame and by a cam on the disk, U. In connection with it is a wedge-shaped appliance governed by the thumbscrew, V, Fig. 1, by which the length of the stitch is regulated. The remaining portions of the invention, including tensions, foot, etc., are clearly shown in the engraving, and require no special description.

It is claimed that this mechanism prevents any entangling, twisting, or abrasion of the thread, and gives a greater elasticity to the seam than any other method. The works of this machine being all inclosed, oiling or soiling of either fabric or thread is prevented.

The various patents obtained by Mr. Lathrop have been combined with that of Mr. W. W. Abbot, which was perfected in 1865, and issued in 1867. This patent covers the method of changing the stitches at will of the operator. By

Fig. 3



this combination of patents, now owned by the Lathrop Combination Sewing Machine Company, of New York, they claim to be able to produce three machines in one with less machinery than in any other, and perform a larger range of work. The factory is at Frankford Station, Philadelphia, Pa.; the sales' room is on Broadway, New York.

THE PAGE PATENT.—THE ATTEMPTS TO ENFORCE IT TO BE RESISTED.

The readers of the *Telegrapher* are not ignorant of the position of the independent telegraphic journal of the country upon this matter, vital to the telegraph interests,—the patent granted to Professor Charles Grafton Page, under a special act of Congress. When the act under which this patent is issued was pending, it was represented, by the gentlemen who had it in charge in both Houses of Congress—Representative Myers in the House, and Senator Patterson in the Senate,—to be a recognition of the claims of an American scientist to an honor which had unjustly been accorded to another person by a foreign government, for certain discoveries and inventions in magneto-electricity and apparatus, and which it was authoritatively stated would infringe upon the prior rights of nobody. Under these representations, the act was passed. When the patent was issued, however, the claims were so framed as to cover certain important particulars in ordinary telegraphic machinery.

Soon after the patent was issued, and before any attempt had been made to enforce it, if such had been contemplated, Professor Page died. Up to this time no intimation had been given of a design to enforce the patent against the telegraphic interests of the country. The legal representatives of Professor Page, however, became impressed with the idea that he had left a very valuable property in this patent, and it was offered to various parties for sale, it being held at $500,000. Two or three licenses were issued under it to parties who were not inclined to contest it, the principal of these being to the American Fire Alarm Telegraph Company of Messrs. Gamewell & Co., and the Gold and Stock Telegraph Company. Among others, the patent was offered to the Western Union Telegraph Company, the original price asked for it being $500,000. This was subsequently reduced to $50 000. The Western Union Company had an exhaustive examination of the validity of the patent made by eminent patent lawyers and experts, and declined to purchase it at any price. After the *clique* which now controls that company organized the plan which has been so persistently followed out during the last four years, looking to an ultimate monopolizing of the telegraphs of the country, this patent was believed to offer an important and valuable aid in the realization of their schemes. Negotiations were accordingly reopened with the heirs of Professor Page, and one half of the patent was purchased for the company for the sum of $25,000, the moiety of interest being left for the time nominally in the possession of the heirs of Professor Page, in order that in its enforcement the widow and orphan dodge might be played for effect on judges and juries. Under the new proprietorship of the patent it was reissued, and the claims amended so as to cover all the vital points of the telegraphic instruments of every description in common use, and the principles upon which such instruments could be constructed.

The plans were now about ready to be carried out, and nearly all the leading patent lawyers received retaining fees, in order to secure the services of such as were desired in enforcing the patent and to prevent others from being available for the defence. In due time actions were commenced—the first being against the city of New York, for infringement of the patent in the instruments used in the police telegraph, another against the Deseret Telegraph Company of Utah, and one or two others up to the present time. The object is to obtain two judgments, either by default or collusion, so that, under the patent law, injunctions may be obtained. Up to this point all had been plain sailing, the *Telegrapher* alone having called attention to the monstrous character of the patent, and its destructive effect upon all telegraphic interests antagonistic to or competitive with the Western Union Company.

At length, however, the interests attacked have taken the alarm, and a vigorous resistance is to be made to the enforcement of the patent. An organization of opposing interests has been effected; able counsel have been employed, and are now engaged in preparing an effective defence. The validity of the patent can be successfully impugned, and will be. The counsel employed are in no respect inferior to those on the other side, and in intimate acquaintance with telegraphic and patent law are even better qualified than those arrayed against them.

In the legal contest which is about to ensue, the entire subject of telegraphic invention will necessarily be exhaustively investigated, and many facts, which are familiar to the few who have given this matter an examination, will be brought prominently into notice. The truth in regard to the real and original invention of electric telegraphy, and the apparatus by which it was effected, will be brought to light, and it is safe to say that the result will astonish the public, and will deprive certain parties of honors popularly accorded, but to which they are not justly entitled. The evidence already attainable is of the most convincing character, and the facts will be brought out without regard to any previous standing or reputation.

This contest will necessarily be long and expensive. As the present owners of the Page patent announce their determination to enforce their presumed rights under it, the contest is unavoidable, and must be met.

The proprietors of every telegraph line and company which does not desire to be destroyed by the great corporation which seeks to overwhelm them, the managers of railroad telegraphs, the manufacturers of telegraphic and electrical instruments and apparatus, inventors and owners of telegraphic patterns and franchises, are all vitally interested in defeating this attempt to monopolize and exact tribute from the business in this country. These will all be called upon to unite in this opposition, and a regard for their own interests will suggest the only course that they can reasonably pursue. Divided among so large an interest, the burden of the defence will not be onerous to the different parties. We have no doubt that the response will be general, prompt, and favorable. The public are not less interested in the matter, as a consideration of the result of establishing such a patent will show; and, if it could be done, every person who uses telegraphic facilities would be taxed to put millions of dollars in the coffers of the ring who seek, by means of this patent, to enrich themselves at the expense of the people of the country.

We have made this statement in order that it may be known that so monstrous an outrage is not to be quietly submitted to, and that those who are called upon to unite in averting such a calamity may be informed of the danger which threatens the telegraphic interest, and prepared to respond promptly.—*Telegrapher.*

Enameling of Photographic Pictures.

One part of gelatin is dissolved in thirteen parts of boiling water, and the solution is then clarified by being passed through a piece of clean flannel. A mixture of three parts of alcohol, four parts water, and one part of this gelatin solution is then prepared, and the same passed through the flannel as before. Both liquids are stored up in corked bottles until required for use.

Take well polished and perfectly smooth glass, free from all scratches or markings, and coat it with good, well filtered normal collodion, the film being allowed to dry in some locality where it is protected from dust. When perfectly dry, the gelatin solution, which has set in the form of a jelly, is warmed in a water bath, and a sufficient quantity of it is put into a warm dish into which the print is to be dipped. At the same time, the bottle containing the alcohol-gelatin is also put into hot water, either to render it fluid or to clarify it, for in very hot weather the alcohol-gelatin remains fluid, although it becomes to some extent turbid. When both solutions are perfectly fluid and clear, the operations may be commenced by coating one of the collodion plates with the alcohol-gelatin mixture, the superfluous liquid being poured back carefully into the stock bottle, and the plate put on end to dry. A second coating is afterwards applied, but with the other gelatin; and after the plate has drained, it is laid upon the table.

While the film is hardening after the first coating, and the alcohol is evaporating, the photograph is immersed bodily in the gelatin solution, which has been poured into a dish for the purpose, care being taken that no air bubbles are formed upon the surface of the paper during the operation. After that, as soon as the second coating of gelatin has been applied, the photograph is withdrawn from the fluid gelatin and allowed to sink gradually, face downwards, upon the gelatinized glass until the two surfaces touch one another. In this way but very few bubbles are formed, and such as are present are mostly forced towards the top of the plate, whence they are easily chased away by a little pressure of the finger nail. In the case, however, of bubbles being formed in the middle or side of the plate, their removal does not incur the slightest difficulty. When all bubbles are removed, the picture is finally pressed down with the fingers and placed to dry.

The mounting of the pictures is conducted in the following manner:—After the picture has dried to some extent upon the collodion plate, which happens after the lapse of three quarters of an hour (or, perhaps, double that time), I coat the back of the print with good fresh paste, and lay thereon a piece of cardboard of suitable size coated with paste in the same manner; the card is allowed to soak in water for half an hour, and immediately before use is well dried by envelopment in a towel. The card is placed carefully upon the back of the print, and pressed gently down with the fingers; a plate of glass is put over it, and some heavy weight employed to press the card down well. After an interval of twelve to eighteen hours, the mount will be perfectly dry.

Although the method may appear somewhat circumstantial to describe, it is very easy to practice, and is, indeed, more simple than any other proceeding yet known.—*F. Haugk, in the Photographische Correspondenz.—Photographic News.*

Spontaneous Combustion.

A paper by Mr. J. Galletly, on the spontaneous ignition of cotton saturated with fatty oils, read at the British Association meeting, detailed some experiments made with the view of giving greater precision to our knowledge of the kindling of cotton or other open combustible materials which happen to have imbibed animal or vegetable fatty oils. Graham mentions that "instances could be given of olive oils igniting upon sawdust, and of greasy rags from butter, heaped together, taking fire within a period of twenty four hours." The danger of fire from this cause is familiar to those manufacturers who coat any textile fabric with varnishes containing drying oils, and also to Turkey red dyers, from the olive oil employed in their process. Generally, it is stated in Watt's Dictionary, this combustion "may take place in intervals varying from a few hours to several weeks, when considerable masses of lampblack, tow, linen, paper, cotton, calico, woolen stuffs, ships' cables, wood ashes, ocher, etc., are slightly soaked in oil and packed in such a manner that the air has moderate access to them." (Watt's Dic. II. p. 880.) Nevertheless, there is great vagueness about the exact conditions in which actual ignition of the mass would take place, what size of a heap might be necessary, and the various powers of different oils to produce this result. Graham states in the report already quoted that the ignition of heaps of the materials under discussion "has been often observed to be greatly favored by a slight warmth, such as the heat of the sun." This is a very important observation. "I shall only, however, mention," said the author, "in the mean time, that the first of my experiments was made at a temperature of about 170° Fahr., but I have made some at a heat a little over 130°, or about the temperature a body acquires by lying perpendicular to the sun's rays; the former temperature might represent the heat attained in the neighborhood of a steam pipe, or in front of an open fire.

Boiled linseed oil with chamber kept about 170° Fahr.—A handful of cotton waste, after being soaked in boiled linseed oil and removing the excess of this by wringing, was placed among dry waste in a box 17 in. long by 7 in. square in the ends. Through a hole in the cover of this box, a thermometer was passed with its bulb resting amongst the oily cotton. Shortly after reaching the temperature of the warm chamber the mercury began to rise rapidly, namely, from 5° to 10° every few minutes, and in 75 minutes from the time the box was placed in the chamber the heat indicated was 350° Fahr. At this point smoke issuing from the box revealed that the cotton was now in a state of active combustion, and on removing it to the free access of air it burst into flame. In another similar experiment, temperature rose more slowly but reached 280° Fahr. in 105 minutes, when, from the appearance of smoke, it was plain that the cotton was burning, and the whole mass was soon in a flame on being placed in a current of air. On a smaller scale, I tried a quantity of the oiled cotton that just filled a common lucifer match box; within an hour it was on fire, the temperature of the chamber being 166° Fahr.

Raw linseed oil, as generally supposed, does not so readily set fire to cotton as the boiled oil; but in two experiments, where the size of the box employed was 6½ in. by 4½ in. square in the ends, active combustion was going on, in the one case in five and the other in four hours.

Rape oil, put up as in first experiment on boiled linseed, resulted, in two trials, in the box and cotton being found in ashes within ten hours, The box being put up at night, the result was only observed in the morning. In one trial I did not get the cotton to ignite in six hours; the chamber, in the cases of this oil and raw linseed, was kept about 170° Fahr. With the five following oils, at a little over 132° Fahr., the quantity of waste used was loosely packed in a paper box holding about the sixteenth of a cubic foot.

Gallipoli olive oil.—The two trials made with this oil gave closely similar results; in one case rapid combustion was going on in a little more than five, and in the other within six, hours.

Castor oil.—I found the oxidation of this oil to proceed so slowly that only on the second day I found the interior of the box to be a mass of charred cotton. Its sp. gr. (963) is remarkably high, and its chemical nature very distinct from the other vegetable oils I have tried, which, no doubt, has some intimate connection with its slow oxidation.

I have tried three oils of animal origin with effects very distinct and instructive.

Lard oil, an oil of any ordinary specific gravity, namely, ·916, produces rapid combustion in four hours.

Sperm oil, which has a specific gravity of only ·883, and is not a glyceride, showed its unusual chemical character by refusal to char the waste.

Seal oil, which has a strong fish oil odor, not unlike the sperm, but a specific gravity of ·928, produced rapid ignition in one hundred minutes. Comparing raw linseed with lard and seal oils, it would appear that the statement is not altogether correct, that drying oils are more liable to spontaneous combustion than non-drying oils. I have also some reason to believe that the rate at which oxidation takes place does not chiefly depend on the presence of small quantities of oxyotised or other easily putrefiable matters, but rather on the particular olein. However, further inquiry on this point is necessary. I have made at least two experiments with each oil, and have got remarkably uniform results. The ignition of the cotton can be calculated on for any oil, with about the same certainty as the point at which sulphur or other combustible material takes fire when heated in the air. So that the term "spontaneous combustion" may be objected to for the same reason that Gerhard objects to "spontaneous decomposition" produced by oxidation. The heavy oils from coal and shale, being chiefly the higher olefines, have a remarkable effect in preventing this oxidation, undoubtedly by giving a certain protection from the air. Mixtures of these oils with 20 per cent rape gave no indication of heat whatever at 170° Fahr.; and even seal oil, with own bulk of mineral oil added to it, did not, at 135°, reach a temperature sufficient to char the cotton."

In conclusion, Mr. Galletly hoped that the experiments he had made would lead to a more elaborate inquiry into the subject, which is one of no little importance.

A thermometer should be placed in an open space, out of the vicinity of high buildings, or any object that impedes the free circulation of air. It should face the north, so as to be always in the shade, should be 12 inches from every neighboring object, should be about 15 inches from the ground, and should be protected against its own radiation to the sky, and against the light reflected from neighboring objects or the ground itself. The thermometer should be read as rapidly as possible, as the heat from the body or the breath influences the instrument.

ON the Jewett building, at Seneca Falls, N. Y., there is an illuminated four faced astronomical clock, built by Charles Fasoldt, Albany, N. Y. The person in charge of it states that it has varied only twelve seconds during the year ending last July.

SULPHOZONE, A SUBSTITUTE FOR SULPHUR.*

BY CHARLES ROBERTS, F. H. C. S., ETC.

Sulphur, in the sublimed, precipitated, or powdered form, is extensively employed by medical men, veterinary surgeons, and horticulturists, for destroying the animal and vegetable parasites infesting man, animals, and plants. The substance to which I have given the name of sulphozone (from its strong smell and powerful chemical action) in order to distinguish it from the sulphur of commerce, is a preparation containing free sulphurous acid as its active and essential principle.

dered sulphur [illegible] large quantities of sublimed and powtinent, for the destruction of the [illegible] country and on the Coning vines, hops, roses, fruit and other trees; and [illegible] attack believe, almost the sole remedy employed for that purpose, as no other has been found so generally effectual or so convenient of application.

From careful and often repeated series of experiments, I have arrived at the conclusion that the beneficial action is to be attributed to the presence of a small but variable quantity of free sulphurous acid (occasionally hyposulphurous acid) which exists as a constant impurity in the sulphur of commerce. Sublimed sulphur contains more acid than powdered crude sulphur, and is more certain in its action, while precipitated sulphur, being almost or altogether free from acid, is quite useless. I find that when substances are carefully purified from all traces of sulphurous acid by repeated washing with spirit and water, they are equally ineffectual in destroying mildew and other vegetable and animal organisms, and that seeds germinate as quickly and as vigorously when sown in pure sulphur as in fine sand, and that molds grow on the surface when a little organic matter, as flour, has been mixed with the sulphur. I find also that cheese mites are not destroyed by pure sulphur, but live and multiply indefinitely in cheese covered with sulphur; though they are immediately destroyed by commercial sublimed sulphur. On the other hand, when pure sulphur is impregnated with sulphurous acid, it destroys mildew and other minute organisms with an energy proportioned to the quantity of acid it contains, and it does not appear that one form of sulphur possesses any advantages over the others, provided the quantity of acid is uniform. Many other substances which contain no sulphur, when impregnated with sulphurous acid in a similar manner and to the same extent, are equally effectual in destroying mildew.

It has been observed that, when a piece of silver leaf is suspended over a roll of sulphur, it is slowly converted into the sulphide of silver, and it has been inferred therefrom that sulphur vaporizes at ordinary temperatures; and the theory has been advanced, by a well known vegetable physiologist, that the oxygen, given off by the leaves of plants to which sulphur has been applied, oxidizes it and produces sulphurous acid, and thus the action of sulphur in destroying vegetable organisms may be accounted for. But this theory is not borne out by my experiments. When silver leaf is suspended over pure sulphur, it does not tarnish more rapidly than when suspended in the air, and its conversion into the sulphide by the roll sulphur may be explained by the fact that that substance contains free sulphurous and hydrosulphurous acids and sulphuretted hydrogen, which are constantly escaping from it. When pure sulphur is applied to the leaves of plants, no evidence of oxidation can be detected by either litmus or starch and iodine paper. If oxidation were to take place under such circumstances, the product, if sulphurous acid in the first instance, would be immediately converted into sulphuric acid by further oxidation, and it could not escape detection. Further: precipitated sulphur, being in a much finer state of division than sublimed sulphur, would be more easily oxidized, and ought to prove the more potent agent; but practically it is found to be the least so.

Sulphur in various forms is used by medical men and veterinary surgeons for the destruction of the itch and other insects, and in the treatment of various diseases (as ringworms), caused or accompanied by fungous growths, infesting the skin and hair of men and animals; but sulphurous acid, in solution, is in many instances substituted for them on account of its more certain action. Many surgeons, indeed, believe that the beneficial action of sulphur ointment in the treatment of itch is to be attributed to the grease of which it is made, rather than to the sulphur it contains; and this is probably true, as the quantity of sulphurous acid is exceedingly small, and I find the action of the ointment is remarkably increased when the sulphur has been strongly impregnated with acid previous to being made into ointment, and this is equally true of its other applications in medicine.

In addition to its destructive action on organized bodies, sulphurous acid possesses a powerful chemical action on the organic and inorganic products of decomposing animal and vegetable substances, and on emanations from persons and animals suffering from infectious diseases; hence it is one of the most potent and valuable disinfectants we possess, and it appears to prevent the spread of small pox, diphtheria, cattle plague, etc. Its qualities as a deodorizer are also very considerable. It attacks and destroys sulphuretted hydrogen, and neutralizes the strong smell of ammonia and other alkaline bases, but without losing its antiseptic properties, or destroying their manurial value. (Crookes.)

From my experiments and observations, and from the well known properties of sulphurous acid, I conclude, therefore, that it is the acid, accidentally present in the sulphur, which is the active agent in the destruction of mildews and blights, and that the sulphur is only the medium for its application. This is a fact, not only of scientific interest, but of great practical and commercial importance; for under the mistaken impression that the sulphur itself is the active agent, great care and expense have been incurred to procure its freedom from acidity, which is by no means necessary.

Sulphur, like charcoal and many other substances, possesses the power of absorbing a large quantity of sulphurous acid; and by a modification in the refining process the acidity may be considerably increased, and the quantity of sulphur correspondingly diminished, and a more certain and uniform agent produced. For horticultural purposes, however, it is necessary to limit the quantity of sulphurous acid, or it will prove destructive to the plant as well as to the parasite. This limit I have established practically by experiments made on rose trees infested with mildew; and as the rose mildew is with difficulty destroyed by common sulphur, except by re[illegible] the name of [illegible] this preparation (to which I have given considered to be of the maximum [illegible] given above) may be times stronger and more potent than sublimed [illegible] or five substituting it, therefore, for sulphur, a great saving will be effected in the cost of sulphur, its carriage, and the time and labor of applying it. There will, moreover, be the additional advantage of not loading the foliage with a large quantity of sulphur powder, which must in some measure impair its health by its mere mechanical presence; and in the case of hops, the brewers will have less ground for objecting to the quality of the produce. Sulphozone, being a fine dry powder like sulphur, may be applied in a similar manner and with the same apparatus, care being taken to use a much smaller quantity (namely, about a quarter of that of sulphur).

For medical, veterinary, and sanitary purposes, a very strong sulphozone has been prepared to take the place of sulphur in the officinal preparation, and for use as a disinfecting powder. This substance is exceedingly destructive to organic life, and is not adapted for horticultural purposes except for dressing the stems and branches of deciduous trees in the winter, and for destroying insects where it can exert no deleterious influence on surrounding vegetation, or for disinfecting and deodorizing manure heaps, etc, for which purpose it is better adapted than any other disinfecting powder, as the sulphurous acid fixes the ammonia—the most valuable constituent of manure—and makes it available for gardening and farming purposes, while chlorine and other disinfectants destroy it, and reduce the value of manure in proportion to the extent of their action in deodorising it.

*Paper read at the Meeting of the Royal Horticultural Society at Birmingham.

Influence of Marriage upon Health.

M. BERTILLON, lately having had to draw up a paper for the Academy of Medicine of Paris on the influence of marriage on mortality, consulted the registers of the only three countries in Europe which were carefully enough kept to give him a reply to his question, those of France, Belgium, and Holland. He shows that if the male sex be first considered, we find that, from 25 to 30, 1,000 married men furnish 6 deaths; 1,000 unmarried, 10 deaths; and 1,000 widowers, 22 deaths. From 30 to 35, of 1,000 married men, 7 die; of 1,000 unmarried men, 11¼ die; and of 1,000 widowers, 19 die. From 35 to 40, of 1,000 married men, 7¼ die, of 1,000 bachelors, 13 die; and of 1,000 widowers, 47¼ die; and so on at all the following ages, the married man continuing to live with greater facility than the bachelor. It has been said that since the most fortunate men can afford to marry, it is not astonishing that these persons should live longer. But this will not, of course, account for the very great mortality of widowers at all ages, which, indeed, surpasses that even of bachelors.

However, it must be noticed that 8,000 young men marry in France yearly, under the age of 20. This is very fatal to such young men, for M. Bertillon finds that, whilst 1,000 young men from 15 to 20 furnish 7 deaths, when unmarried, no less than fifty deaths occur among 1,000 young married men under 20. Women seem to reap less advantage from marriage than men, and there is but little difference in the mortality of unmarried and married women before the age of 25. It is but little marked even between 25 and 30.

Apparatus for the Production of Ozone with Electricity of High Tension.

Experiment has shown that in the production of ozone by electricity, the maximum amount of oxygen is ozonised by the silent or glow discharge. In using the Holtz electro machine, the form of the apparatus usually employed must be varied to give good results.

When the poles of the machine itself are separated to a sufficient distance, the electricity passes between them, either in the form of a diffuse brush, spanning the whole interval, or with a very minute brush upon the negative pole and a glow upon the positive, the intermediate space not being visibly luminous. This is the so-called dark, or silent discharge.

When this occurs, the strong odor shows that a considerable amount of the atmospheric oxygen is converted into ozone.

If this discharge is made to take place in an enclosed space through which air or oxygen can be driven, the ozonising effect of the electricity is hightened and can be utilized. The apparatus which I have employed, and which has afforded very satisfactory results, consists of a straight glass tube about 20 centimeters long and having an internal diameter of 25 centimeters, the two ends being stopped with corks covered on the inner side with a thin coating of cement to protect them from the action of the ozone. Through the axis of each cork is inserted a glass tube of about 5 m.m. caliber and 7 centimeters in length, having a branch tube inserted perpendicularly at the middle, and long enough to permit a rubber tube to be slipped upon it. The outer ends of the tubes themselves are closely stopped with corks, through which are passed straight, thick copper wires carrying suitable terminals at their inner ends, and bent into a ring at the others. They are fitted so as to make tight joints, but to allow of motion in order to vary the distance between their inner ends. One of these wires carries a small ball; the other terminates in a disk with rounded edge, set perpendicularly to the axis of the tube, and so large as to leave an annular space of some two or three millimetres breadth around it. The gas is admitted through one of the branch tubes and escapes through the other, after having passed through the whole length of the tube.

In using the apparatus, the wires must be connected with the poles of the machine in such a manner that the disk becomes the terminal, as this arrangement gives the greatest degree of expansion and diffuseness to the current. On turning the machine and adjusting the ball and disk to a proper distance, a nebulous aigrette surrounds the latter, quite filling the interval between it and the wall of the tube, while the part of the tube between the disk and ball is crowded with innumerable hazy streams converging upon the positive pass through [illegible] simply causing the latter to be covered with a faint in great quantity. The [illegible] or oxygen sent into the tube must with the machine when this apparatus is [illegible] ily produced, and [illegible] used

Noctilucine.

Mr. T. L. Phipson treats of noctilucine as a new and special organic substance, widely spread throughout the world of Nature, and which shines like phosphorus. It is not only the cause of the phosphorescence of the flesh of animals and fish, but it is also secreted by glowworms, fire flies, *scolopendra*, probably by all animate objects that shine in the dark, and produced by certain living plants (agaricus, euphorbia, etc.,) and by the decomposition of vegetable matter under certain special conditions, such as the fermentation of potatoes, etc.

At ordinary temperatures, noctilucine is a nitrogenous, almost liquid substance, capable of dilution with water, but insoluble, and appearing to have a density slightly less than that fluid. It is white, contains (when newly extracted from a luminous animal, living or dead) a small proportion of water, and has a slight odor somewhat resembling caprylic acid. Insoluble in alcohol or ether, it is readily decomposed by mineral acids and alkalies; potash sets ammonia free from it. Fermented in contact with water, it manifests after a time the odor of decayed cheese. While damp, noctilucine absorbs oxygen and gives off carbonic acid gas; but exposed to the air, it dries in thin, translucid, amorphous flakes, very similar to the slime of slugs. When fresh, it is strongly phosphorescent, owing to its oxidation by contact with moist air, and it will even shine under water while there is any air. In oxygen gas it is a little more brilliant; and it is more especially so in air when the wind blows from the S.W., that is, in the presence of ozone. This production of light ceases so soon as the oxygen of the matter is consumed; but if air in the smallest quantity is adherent to it, noctilucine shines for some moments in moist carbonic acid gas.

In phosphorescent animals, noctilucene is secreted by a special organ, and appears to be at once effectively luminous. Under certain conditions of temperature and humidity, it is also generated by dead animal matter, flesh, blood, and sometimes urine.

Whencesoever it originates, its light is invariable and monochromatic, giving a spectrum mainly visible between the lines E and F, and possessing always the same chemical properties.

The *scolopendra electrica* secretes noctilucene in a state of comparative purity, and by making several of these myriapods run about over a large glass capsule, in the month of September, a sufficient quantity may be obtained for examination and analysis to determine its chief properties. It can also be obtained, but is less pure, from glowworms and the phosphorescent surface of dead fish, by scraping the luminous matter on to damp filter paper.

The secretion of noctilucine by the superior luminous creatures, such as insects (*lampyrus, elater*, etc.), is doubtless up to a certain point under the influence of the nervous system, so that they have the faculty of causing their light to cease at will, in which case the secretion is arrested for the time; but glowworms' eggs continue to shine for some time after they have been laid, so that they must also contain a small quantity of noctilucine. In the lower orders of animate beings, such as the little *noctiluca miliaris* of the English Channel, the flexible *polypi*, etc., there is also no doubt of the existence of a special organ for the production of the light; and, where there are scarcely any indications of a nervous system, the secretion of the material appears frequently to be susceptible to the influence of external circumstances.—*Mechanics' Magazine.*

MR. JOHN KEEFE, a fireman on the Northern Central Railroad, did a noble thing on Sept. 23. As the express train going south was approaching Milo Station, Yates county, N. Y., a little child three years old was seen to be on the track, but too near for the train to be stopped before reaching it. This man, John Keefe, thereupon climbed forward on the engine, got down on the cow-catcher, and, as the train thundered along, reached forward and picked up the child from destruction.

THE importance and value of some of the patented stove improvements may be judged of from statistics which were made public at the recent meeting of the stove manufacturers of the United States, held in Cincinnati. It appears that this interest has, in this country, a combined capital of over $30,000,000, that it employs 150,000 men, and that the probable product, during the current year, will not fall short of 2,500,000 stoves.

THE PAGE PATENT.—THE ATTEMPTS TO ENFORCE IT TO BE RESISTED.

The readers of the *Telegrapher* are not ignorant of the position of the independent telegraphic journal of the country upon this matter, vital to the telegraph interests,—the patent granted to Professor Charles Grafton Page, under a special act of Congress. When the act under which this patent is issued was pending, it was represented, by the gentlemen who had it in charge in both Houses of Congress—Representative Myers in the House, and Senator Patterson in the Senate,—to be a recognition of the claims of an American scientist to an honor which had unjustly been accorded to another person by a foreign government, for certain discoveries and inventions in magneto-electricity and apparatus, and which it was authoritatively stated would infringe upon the prior rights of nobody. Under these representations, the act was passed. When the patent was issued, however, the claims were so framed as to cover certain important particulars in ordinary telegraphic machinery.

Soon after the patent was issued, and before any attempt had been made to enforce it, if such had been contemplated, Professor Page died. Up to this time no intimation had been given of a design to enforce the patent against the telegraphic interests of the country. The legal representatives of Professor Page, however, became impressed with the idea that he had left a very valuable property in this patent, and it was offered to various parties for sale, it being held at $500,000. Two or three licenses were issued under it to parties who were not inclined to contest it, the principal of these being to the American Fire Alarm Telegraph Company of Messrs. Gamewell & Co., and the Gold and Stock Telegraph Company. Among others, the patent was offered to the Western Union Telegraph Company, the original price asked for it being $500,000. This was subsequently reduced to $50 000. The Western Union Company had an exhaustive examination of the validity of the patent made by eminent patent lawyers and experts, and declined to purchase it at any price. After the *clique* which now controls that company organized the plan which has been so persistently followed out during the last four years, looking to an ultimate monopolizing of the telegraphs of the country, this patent was believed to offer an important and valuable aid in the realization of their schemes. Negotiations were accordingly reopened with the heirs of Professor Page, and one half of the patent was purchased for the company for the sum of $25,000, the moiety of interest being left for the time nominally in the possession of the heirs of Professor Page, in order that in its enforcement the widow and orphan dodge might be played for effect on judges and juries. Under the new proprietorship of the patent it was reissued, and the claims amended so as to cover all the vital points of the telegraphic instruments of every description in common use, and the principles upon which such instruments could be constructed.

The plans were now about ready to be carried out, and nearly all the leading patent lawyers received retaining fees, in order to secure the services of such as were desired in enforcing the patent and to prevent others from being available for the defence. In due time actions were commenced—the first being against the city of New York, for infringement of the patent in the instruments used in the police telegraph, another against the Deseret Telegraph Company of Utah, and one or two others up to the present time. The object is to obtain two judgments, either by default or collusion, so that, under the patent law, injunctions may be obtained. Up to this point all had been plain sailing, the *Telegrapher* alone having called attention to the monstrous character of the patent, and its destructive effect upon all telegraphic interests antagonistic to or competitive with the Western Union Company.

At length, however, the interests attacked have taken the alarm, and a vigorous resistance is to be made to the enforcement of the patent. An organization of opposing interests has been effected; able counsel have been employed, and are now engaged in preparing an effective defence. The validity of the patent can be successfully impugned, and will be. The counsel employed are in no respect inferior to those on the other side, and in intimate acquaintance with telegraphic and patent law are even better qualified than those arrayed against them.

In the legal contest which is about to ensue, the entire subject of telegraphic invention will necessarily be exhaustively investigated, and many facts, which are familiar to the few who have given this matter an examination, will be brought prominently into notice. The truth in regard to the real and original invention of electric telegraphy, and the apparatus by which it was effected, will be brought to light, and it is safe to say that the result will astonish the public, and will deprive certain parties of honors popularly accorded, but to which they are not justly entitled. The evidence already attainable is of the most convincing character, and the facts will be brought out without regard to any previous standing or reputation.

This contest will necessarily be long and expensive. As the present owners of the Page patent announce their determination to enforce their presumed rights under it, the contest is unavoidable, and must be met.

The proprietors of every telegraph line and company which does not desire to be destroyed by the great corporation which seeks to overwhelm them, the managers of railroad telegraphs, the manufacturers of telegraphic and electrical instruments and apparatus, inventors and owners of telegraphic patterns and franchises, are all vitally interested in defeating this attempt to monopolize and exact tribute from the business in this country. These will all be called upon to unite in this opposition, and a regard for their own interests will suggest the only course that they can reasonably pursue. Divided among so large an interest, the burden of the defence will not be onerous to the different parties. We have no doubt that the response will be general, prompt, and favorable. The public are not less interested in the matter, as a consideration of the result of establishing such a patent will show; and, if it could be done, every person who uses telegraphic facilities would be taxed to put millions of dollars in the coffers of the ring who seek, by means of this patent, to enrich themselves at the expense of the people of the country.

We have made this statement in order that it may be known that so monstrous an outrage is not to be quietly submitted to, and that those who are called upon to unite in averting such a calamity may be informed of the danger which threatens the telegraphic interest, and prepared to respond promptly.—*Telegrapher.*

Enameling of Photographic Pictures.

One part of gelatin is dissolved in thirteen parts of boiling water, and the solution is then clarified by being passed through a piece of clean flannel. A mixture of three parts of alcohol, four parts water, and one part of this gelatin solution is then prepared, and the same passed through the flannel as before. Both liquids are stored up in corked bottles until required for use.

Take well polished and perfectly smooth glass, free from all scratches or markings, and coat it with good, well filtered normal collodion, the film being allowed to dry in some locality where it is protected from dust. When perfectly dry, the gelatin solution, which has set in the form of a jelly, is warmed in a water bath, and a sufficient quantity of it is put into a warm dish into which the print is to be dipped. At the same time, the bottle containing the alcohol-gelatin is also put into hot water, either to render it fluid or to clarify it, for in very hot weather the alcohol-gelatin remains fluid, although it becomes to some extent turbid. When both solutions are perfectly fluid and clear, the operations may be commenced by coating one of the collodion plates with the alcohol-gelatin mixture, the superfluous liquid being poured back carefully into the stock bottle, and the plate put on end to dry. A second coating is afterwards applied, but with the other gelatin; and after the plate has drained, it is laid upon the table.

While the film is hardening after the first coating, and the alcohol is evaporating, the photograph is immersed bodily in the gelatin solution, which has been poured into a dish for the purpose, care being taken that no air bubbles are formed upon the surface of the paper during the operation. After that, as soon as the second coating of gelatin has been applied, the photograph is withdrawn from the fluid gelatin and allowed to sink gradually, face downwards, upon the gelatinized glass until the two surfaces touch one another. In this way but very few bubbles are formed, and such as are present are mostly forced towards the top of the plate, whence they are easily chased away by a little pressure of the finger nail. In the case, however, of bubbles being formed in the middle or side of the plate, their removal does not incur the slightest difficulty. When all bubbles are removed, the picture is finally pressed down with the fingers and placed to dry.

The mounting of the pictures is conducted in the following manner:—After the picture has dried to some extent upon the collodion plate, which happens after the lapse of three quarters of an hour (or, perhaps, double that time), I coat the back of the print with good fresh paste, and lay thereon a piece of cardboard of suitable size coated with paste in the same manner; the card is allowed to soak in water for half an hour, and immediately before use is well dried by envelopment in a towel. The card is placed carefully upon the back of the print, and pressed gently down with the fingers; a plate of glass is put over it, and some heavy weight employed to press the card down well. After an interval of twelve to eighteen hours, the mount will be perfectly dry.

Although the method may appear somewhat circumstantial to describe, it is very easy to practice, and is, indeed, more simple than any other proceeding yet known.—*F. Haugk, in the Photographische Correspondenz.—Photographic News.*

Spontaneous Combustion.

A paper by Mr. J. Galletly, on the spontaneous ignition of cotton saturated with fatty oils, read at the British Association meeting, detailed some experiments made with the view of giving greater precision to our knowledge of the kindling of cotton or other open combustible materials which happen to have imbibed animal or vegetable fatty oils. Graham mentions that "instances could be given of olive oils igniting upon sawdust, and of greasy rags from butter, heaped together, taking fire within a period of twenty four hours." The danger of fire from this cause is familiar to those manufacturers who coat any textile fabric with varnishes containing drying oils, and also to Turkey red dyers, from the olive oil employed in their process. Generally, it is stated in Watt's Dictionary, this combustion "may take place in intervals varying from a few hours to several weeks, when considerable masses of lampblack, tow, linen, paper, cotton, calico, woolen stuffs, ships' cables, wood ashes, ocher, etc., are slightly soaked in oil and packed in such a manner that the air has moderate access to them." (Watt's Dic. II. p. 880.) Nevertheless, there is great vagueness about the exact conditions in which actual ignition of the mass would take place, what size of a heap might be necessary, and the various powers of different oils to produce this result. Graham states in the report already quoted that the ignition of heaps of the materials under discussion "has been often observed to be greatly favored by a slight warmth, such as the heat of the sun." This is a very important observation. "I shall only, however, mention," said the author, "in the mean time, that the first of my experiments was made at a temperature of about 170° Fahr., but I have made some at a heat a little over 130°, or about the temperature a body acquires by lying perpendicular to the sun's rays; the former temperature might represent the heat attained in the neighborhood of a steam pipe, or in front of an open fire.

Boiled linseed oil with chamber kept about 170° Fahr.—A handful of cotton waste, after being soaked in boiled linseed oil and removing the excess of this by wringing, was placed among dry waste in a box 17 in. long by 7 in. square in the ends. Through a hole in the cover of this box, a thermometer was passed with its bulb resting amongst the oily cotton. Shortly after reaching the temperature of the warm chamber the mercury began to rise rapidly, namely, from 5° to 10° every few minutes, and in 75 minutes from the time the box was placed in the chamber the heat indicated was 350° Fahr. At this point smoke issuing from the box revealed that the cotton was now in a state of active combustion, and on removing it to the free access of air it burst into flame. In another similar experiment, temperature rose more slowly but reached 280° Fahr. in 105 minutes, when, from the appearance of smoke, it was plain that the cotton was burning, and the whole mass was soon in a flame on being placed in a current of air. On a smaller scale, I tried a quantity of the oiled cotton that just filled a common lucifer match box; within an hour it was on fire, the temperature of the chamber being 166° Fahr.

Raw linseed oil, as generally supposed, does not so readily set fire to cotton as the boiled oil; but in two experiments, where the size of the box employed was 6½ in. by 4½ in. square in the ends, active combustion was going on, in the one case in five and the other in four hours.

Rape oil, put up as in first experiment on boiled linseed, resulted, in two trials, in the box and cotton being found in ashes within ten hours. The box being put up at night, the result was only observed in the morning. In one trial I did not get the cotton to ignite in six hours; the chamber, in the cases of this oil and raw linseed, was kept about 170° Fahr. With the five following oils, at a little over 132° Fahr., the quantity of waste used was loosely packed in a paper box holding about the sixteenth of a cubic foot.

Gallipoli olive oil.—The two trials made with this oil gave closely similar results; in one case rapid combustion was going on in a little more than five, and in the other within six, hours.

Castor oil.—I found the oxidation of this oil to proceed so slowly that only on the second day I found the interior of the box to be a mass of charred cotton. Its sp. gr. (963) is remarkably high, and its chemical nature very distinct from the other vegetable oils I have tried, which, no doubt, has some intimate connection with its slow oxidation.

I have tried three oils of animal origin with effects very distinct and instructive.

Lard oil, an oil of any ordinary specific gravity, namely, ·916, produces rapid combustion in four hours.

Sperm oil, which has a specific gravity of only ·883, and is not a glyceride, showed its unusual chemical character by refusal to char the waste.

Seal oil, which has a strong fish oil odor, not unlike the sperm, but a specific gravity of ·928, produced rapid ignition in one hundred minutes. Comparing raw linseed with lard and seal oils, it would appear that the statement is not altogether correct, that drying oils are more liable to spontaneous combustion than non-drying oils. I have also some reason to believe that the rate at which oxidation takes place does not chiefly depend on the presence of small quantities of oxyotised or other easily putrefiable matters, but rather on the particular olein. However, further inquiry on this point is necessary. I have made at least two experiments with each oil, and have got remarkably uniform results. The ignition of the cotton can be calculated on for any oil, with about the same certainty as the point at which sulphur or other combustible material takes fire when heated in the air. So that the term "spontaneous combustion" may be objected to for the same reason that Gerhard objects to "spontaneous decomposition" produced by oxidation. The heavy oils from coal and shale, being chiefly the higher olefines, have a remarkable effect in preventing this oxidation, undoubtedly by giving a certain protection from the air. Mixtures of these oils with 20 per cent rape gave no indication of heat whatever at 170° Fahr.; and even seal oil, with own bulk of mineral oil added to it, did not, at 135°, reach a temperature sufficient to char the cotton."

In conclusion, Mr. Galletly hoped that the experiments he had made would lead to a more elaborate inquiry into the subject, which is one of no little importance.

A thermometer should be placed in an open space, out of the vicinity of high buildings, or any object that impedes the free circulation of air. It should face the north, so as to be always in the shade, should be 12 inches from every neighboring object, should be about 15 inches from the ground, and should be protected against its own radiation to the sky, and against the light reflected from neighboring objects or the ground itself. The thermometer should be read as rapidly as possible, as the heat from the body or the breath influences the instrument.

ON the Jewett building, at Seneca Falls, N. Y., there is an illuminated four faced astronomical clock, built by Charles Fasoldt, Albany, N. Y. The person in charge of it states that it has varied only twelve seconds during the year ending last July.

SULPHOZONE, A SUBSTITUTE FOR SULPHUR.*

BY CHARLES ROBERTS, F. R. C. S., ETC.

Sulphur, in the sublimed, precipitated, or powdered form, is extensively employed by medical men, veterinary surgeons, and horticulturists, for destroying the animal and vegetable parasites infesting man, animals, and plants. The substance to which I have given the name of sulphozone (from its strong smell and powerful chemical action) in order to distinguish it from the sulphur of commerce, is a preparation containing free sulphurous acid as its active and essential principle.

For many years past, large quantities of sublimed and powdered sulphur have been used in this country and on the Continent, for the destruction of the mildew and blight attacking vines, hops, roses, fruit and other trees; and it is now, I believe, almost the sole remedy employed for that purpose, as no other has been found so generally effectual or so convenient of application.

From careful and often repeated series of experiments, I have arrived at the conclusion that the beneficial action is to be attributed to the presence of a small but variable quantity of free sulphurous acid (occasionally hyposulphurous acid) which exists as a constant impurity in the sulphur of commerce. Sublimed sulphur contains more acid than powdered crude sulphur, and is more certain in its action, while precipitated sulphur, being almost or altogether free from acid, is quite useless. I find that when substances are carefully purified from all traces of sulphurous acid by repeated washing with spirit and water, they are equally ineffectual in destroying mildew and other vegetable and animal organisms, and that seeds germinate as quickly and as vigorously when sown in pure sulphur as in fine sand, and that molds grow on the surface when a little organic matter, as flour, has been mixed with the sulphur. I find also that cheese mites are not destroyed by pure sulphur, but live and multiply indefinitely in cheese covered with sulphur; though they are immediately destroyed by commercial sublimed sulphur. On the other hand, when pure sulphur is impregnated with sulphurous acid, it destroys mildew and other minute organisms with an energy proportioned to the quantity of acid it contains, and it does not appear that one form of sulphur possesses any advantages over the others, provided the quantity of acid is uniform. Many other substances which contain no sulphur, when impregnated with sulphurous acid in a similar manner and to the same extent, are equally effectual in destroying mildew.

It has been observed that, when a piece of silver leaf is suspended over a roll of sulphur, it is slowly converted into the sulphide of silver, and it has been inferred therefrom that sulphur vaporizes at ordinary temperatures; and the theory has been advanced, by a well known vegetable physiologist, that the oxygen, given off by the leaves of plants to which sulphur has been applied, oxidizes it and produces sulphurous acid, and thus the action of sulphur in destroying vegetable organisms may be accounted for. But this theory is not borne out by my experiments. When silver leaf is suspended over pure sulphur, it does not tarnish more rapidly than when suspended in the air, and its conversion into the sulphide by the roll sulphur may be explained by the fact that that substance contains free sulphurous and hydrosulphurous acids and sulphuretted hydrogen, which are constantly escaping from it. When pure sulphur is applied to the leaves of plants, no evidence of oxidation can be detected by either litmus or starch and iodine paper. If oxidation were to take place under such circumstances, the product, if sulphurous acid in the first instance, would be immediately converted into sulphuric acid by further oxidation, and it could not escape detection. Further: precipitated sulphur, being in a much finer state of division than sublimed sulphur, would be more easily oxidized, and ought to prove the more potent agent; but practically it is found to be the least so.

Sulphur in various forms is used by medical men and veterinary surgeons for the destruction of the itch and other insects, and in the treatment of various diseases (as ringworms), caused or accompanied by fungous growths, infesting the skin and hair of men and animals; but sulphurous acid, in solution, is in many instances substituted for them on account of its more certain action. Many surgeons, indeed, believe that the beneficial action of sulphur ointment in the treatment of itch is to be attributed to the grease of which it is made, rather than to the sulphur it contains; and this is probably true, as the quantity of sulphurous acid is exceedingly small, and I find the action of the ointment is remarkably increased when the sulphur has been strongly impregnated with acid previous to being made into ointment, and this is equally true of its other applications in medicine.

In addition to its destructive action on organized bodies, sulphurous acid possesses a powerful chemical action on the organic and inorganic products of decomposing animal and vegetable substances, and on emanations from persons and animals suffering from infectious diseases; hence it is one of the most potent and valuable disinfectants we possess, and it appears to prevent the spread of small pox, diphtheria, cattle plague, etc. Its qualities as a deodorizer are also very considerable. It attacks and destroys sulphuretted hydrogen, and neutralizes the strong smell of ammonia and other alkaline bases, but without losing its antiseptic properties, or destroying their manurial value. (Crookes.)

From my experiments and observations, and from the well known properties of sulphurous acid, I conclude, therefore, that it is the acid, accidentally present in the sulphur, which is the active agent in the destruction of mildews and blights, and that the sulphur is only the medium for its application. This is a fact, not only of scientific interest, but of great practical and commercial importance; for under the mistaken impression that the sulphur itself is the active agent, great care and expense have been incurred to secure its freedom from acidity, which is by no means necessary.

Sulphur, like charcoal and many other substances, possesses the power of absorbing a large quantity of sulphurous acid; and by a modification in the refining process the acidity may be considerably increased, and the quantity of sulphur correspondingly diminished, and a more certain and uniform agent produced. For horticultural purposes, however, it is necessary to limit the quantity of sulphurous acid, or it will prove destructive to the plant as well as to the parasite. This limit I have established practically by experiments made on rose trees infested with mildew; and as the rose mildew is with difficulty destroyed by common sulphur, except by repeated applications, this preparation (to which I have given the name of sulphozone, for reasons given above) may be considered to be of the maximum strength, and four or five times stronger and more potent than sublimed sulphur. In substituting it, therefore, for sulphur, a great saving will be effected in the cost of sulphur, its carriage, and the time and labor of applying it. There will, moreover, be the additional advantage of not loading the foliage with a large quantity of sulphur powder, which must in some measure impair its health by its mere mechanical presence; and in the case of hops, the brewers will have less ground for objecting to the quality of the produce. Sulphozone, being a fine dry powder like sulphur, may be applied in a similar manner and with the same apparatus, care being taken to use a much smaller quantity (namely, about a quarter of that of sulphur).

For medical, veterinary, and sanitary purposes, a very strong sulphozone has been prepared to take the place of sulphur in the officinal preparation, and for use as a disinfecting powder. This substance is exceedingly destructive to organic life, and is not adapted for horticultural purposes except for dressing the stems and branches of deciduous trees in the winter, and for destroying insects where it can exert no deleterious influence on surrounding vegetation, or for disinfecting and deodorizing manure heaps, etc., for which purpose it is better adapted than any other disinfecting powder, as the sulphurous acid fixes the ammonia—the most valuable constituent of manure—and makes it available for gardening and farming purposes, while chlorine and other disinfectants destroy it, and reduce the value of manure in proportion to the extent of their action in deodorizing it.

*Paper read at the Meeting of the Royal Horticultural Society at Birmingham.

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M. BERTILLON, lately having had to draw up a paper for the Academy of Medicine of Paris on the influence of marriage on mortality, consulted the registers of the only three countries in Europe which were carefully enough kept to give him a reply to his question, those of France, Belgium, and Holland. He shows that if the male sex be first considered, we find that, from 25 to 30, 1,000 married men furnish 6 deaths; 1,000 unmarried, 10 deaths; and 1,000 widowers, 22 deaths. From 30 to 35, of 1,000 married men, 7 die; of 1,000 unmarried men, 11¼ die; and of 1,000 widowers, 19 die. From 35 to 40, of 1,000 married men, 7¼ die, of 1,000 bachelors, 13 die; and of 1,000 widowers, 47¼ die; and so on at all the following ages, the married man continuing to live with greater facility than the bachelor. It has been said that since the most fortunate men can afford to marry, it is not astonishing that these persons should live longer. But this will not, of course, account for the very great mortality of widowers at all ages, which, indeed, surpasses that even of bachelors.

However, it must be noticed that 8,000 young men marry in France yearly, under the age of 20. This is very fatal to such young men, for M. Bertillon finds that, whilst 1,000 young men from 15 to 20 furnish 7 deaths, when unmarried, no less than fifty deaths occur among 1,000 young married men under 20. Women seem to reap less advantage from marriage than men, and there is but little difference in the mortality of unmarried and married women before the age of 25. It is but little marked even between 25 and 30.

Apparatus for the Production of Ozone with Electricity of High Tension.

Experiment has shown that in the production of ozone by electricity, the maximum amount of oxygen is ozonised by the silent or glow discharge. In using the Holtz electro machine, the form of the apparatus usually employed must be varied to give good results.

When the poles of the machine itself are separated to a sufficient distance, the electricity passes between them, either in the form of a diffuse brush, spanning the whole interval, or with a very minute brush upon the negative pole and a glow upon the positive, the intermediate space not being visibly luminous. This is the so-called dark, or silent discharge.

When this occurs, the strong odor shows that a considerable amount of the atmospheric oxygen is converted into ozone.

If this discharge is made to take place in an enclosed space through which air or oxygen can be driven, the ozonising effect of the electricity is hightened and can be utilized. The apparatus which I have employed, and which has afforded very satisfactory results, consists of a straight glass tube about 20 centimeters long and having an internal diameter of 25 centimeters, the two ends being stopped with corks covered on the inner side with a thin coating of cement to protect them from the action of the ozone. Through the axis of each cork is inserted a glass tube of about 5 m.m. caliber and 7 centimeters in length, having a branch tube inserted perpendicularly at the middle, and long enough to permit a rubber tube to be slipped upon it. The outer ends of the tubes themselves are closely stopped with corks, through which are passed straight, thick copper wires carrying suitable terminals at their inner ends, and bent into a ring at the others. They are fitted so as to make tight joints, but to allow of motion in order to vary the distance between their inner ends. One of these wires carries a small ball; the other terminates in a disk with rounded edge, set perpendicularly to the axis of the tube, and so large as to leave an annular space of some two or three millimetres breadth around it. The gas is admitted through one of the branch tubes and escapes through the other, after having passed through the whole length of the tube.

In using the apparatus, the wires must be connected with the poles of the machine in such a manner that the disk becomes the terminal, as this arrangement gives the greatest degree of expansion and diffuseness to the current. On turning the machine and adjusting the ball and disk to a proper distance, a nebulous aigrette surrounds the latter, quite filling the interval between it and the wall of the tube, while the part of the tube between the disk and ball is crowded with innumerable hazy streams converging upon the positive pole, or simply causing the latter to be covered with a faint glow. A current of air or oxygen sent into the tube must pass through this, and ozone is very rapidly produced, and in great quantity. The condensers are of course not used with the machine when this apparatus is employed.

Noctilucine.

Mr. T. L. Phipson treats of noctilucine as a new and special organic substance, widely spread throughout the world of Nature, and which shines like phosphorus. It is not only the cause of the phosphorescence of the flesh of animals and fish, but it is also secreted by glowworms, fire flies, *scolopendra*, probably by all animate objects that shine in the dark, and produced by certain living plants (agaricus, euphorbia, etc.,) and by the decomposition of vegetable matter under certain special conditions, such as the fermentation of potatoes, etc.

At ordinary temperatures, noctilucine is a nitrogenous, almost liquid substance, capable of dilution with water, but insoluble, and appearing to have a density slightly less than that fluid. It is white, contains (when newly extracted from a luminous animal, living or dead) a small proportion of water, and has a slight odor somewhat resembling caprylic acid. Insoluble in alcohol or ether, it is readily decomposed by mineral acids and alkalies; potash sets ammonia free from it. Fermented in contact with water, it manifests after a time the odor of decayed cheese. While damp, noctilucine absorbs oxygen and gives off carbonic acid gas; but exposed to the air, it dries in thin, translucid, amorphous flakes, very similar to the slime of slugs. When fresh, it is strongly phosphorescent, owing to its oxidation by contact with moist air, and it will even shine under water while there is any air. In oxygen gas it is a little more brilliant; and it is more especially so in air when the wind blows from the S.W., that is, in the presence of ozone. This production of light ceases so soon as the oxygen of the matter is consumed; but if air in the smallest quantity is adherent to it, noctilucine shines for some moments in moist carbonic acid gas.

In phosphorescent animals, noctilucene is secreted by a special organ, and appears to be at once effectively luminous. Under certain conditions of temperature and humidity, it is also generated by dead animal matter, flesh, blood, and sometimes urine.

Whencesoever it originates, its light is invariable and monochromatic, giving a spectrum mainly visible between the lines E and F, and possessing always the same chemical properties.

The *scolopendra electrica* secretes noctilucene in a state of comparative purity, and by making several of these myriapods run about over a large glass capsule, in the month of September, a sufficient quantity may be obtained for examination and analysis to determine its chief properties. It can also be obtained, but is less pure, from glowworms and the phosphorescent surface of dead fish, by scraping the luminous matter on to damp filter paper.

The secretion of noctilucine by the superior luminous creatures, such as insects (*lampyrus, elater*, etc.), is doubtless up to a certain point under the influence of the nervous system, so that they have the faculty of causing their light to cease at will, in which case the secretion is arrested for the time; but glowworms' eggs continue to shine for some time after they have been laid, so that they must also contain a small quantity of noctilucine. In the lower orders of animate beings, such as the little *noctiluca miliaris* of the English Channel, the flexible *polypi*, etc., there is also no doubt of the existence of a special organ for the production of the light; and, where there are scarcely any indications of a nervous system, the secretion of the material appears frequently to be susceptible to the influence of external circumstances.—*Mechanics' Magazine.*

MR. JOHN KEEFE, a fireman on the Northern Central Railroad, did a noble thing on Sept. 23. As the express train going south was approaching Milo Station, Yates county, N. Y., a little child three years old was seen to be on the track, but too near for the train to be stopped before reaching it. This man, John Keefe, thereupon climbed forward on the engine, got down on the cow-catcher, and, as the train thundered along, reached forward and picked up the child from destruction.

THE importance and value of some of the patented stove improvements may be judged of from statistics which were made public at the recent meeting of the stove manufacturers of the United States, held in Cincinnati. It appears that this interest has, in this country, a combined capital of over $30,000,000, that it employs 150,000 men, and that the probable product, during the current year, will not fall short of 2,500,000 stoves.

SELF-FEEDING DRILL.

We lay before our readers, in the accompanying engraving, a neat, convenient, and effective form of bow or fiddle drill, especially designed for use by jewelers, gunsmiths, and others having occasion to do fine work in metals. The disadvantages of the ordinary instrument commonly used, requiring, as it does, the constant attention and both hands of the workman, will, it is believed, be obviated by the use of this invention.

Fig. 1, in the illustration, is a perspective view of the device which, as will be seen, can be immovably attached to any table or work bench by means of the plates and ordinary screws. Fig. 2 shows the drill and chuck, and the mode of attaching the same by a screw thread on the spindle. Any variety of style of chuck may be thus attached, or the chuck being removed the drill may be inserted directly in the spindle.

A is a bar of steel passing through slots cut in the frame and securely held in any position by the thumbscrew on one of the upright arms. The end of the bar, A, is bent upwards, and is provided with a metal casing, B, extending horizontally outward. In this casing is a plunger, surrounded by a strong spiral spring, shown through the part of the casing that is broken away. This spring acts on a flange on the plunger, forcing the latter a certain distance out of the casing and toward the drill, D. At the outer end of the plunger, and square with the drill, is a face plate, against which the work to be bored is placed. The plunger is then pressed back in the casing, and the bar, A, drawn along and secured, so that the action of the spiral spring firmly presses the work against the drill point. The latter is then set in motion by means of the bow acting on the pulley wheel on the spindle. It is evident that, by the action of the drill deepening the hole, the pressure of the spiral spring feeds the work on continuously.

Fig. 1

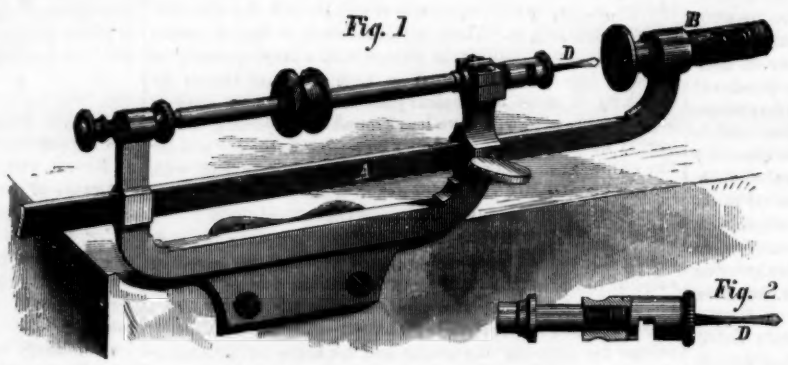


Fig. 2

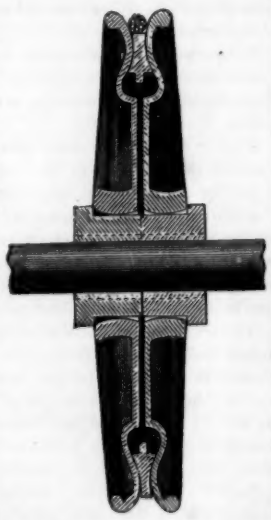
HALES' SELF-FEEDING DRILL.

The instrument may be placed either in a horizontal position, as shown, or it may be arranged vertically on the corner of the bench, so as to bore straight downwards. When thus placed, a hand wheel and gearing may be added, so as to turn the spindle without the aid of the bow. For workers in precious metals, this instrument is especially suited. It is perfectly steady and penetrates with exactness. The space underneath the sliding bar, A, admits of the introduction of a sheet of paper, so that all dust or filings may be saved, while the bar itself may be extended, thus admitting of the drilling of holes of any required depth.

The patentee of this machine is desirous of selling the entire right. For further information address John Hale, Scranton, Pa.

Pulley for Wire Ropes.

The illustration shows an improved pulley for preventing the slipping of the wire rope running over it. The hub of the pulley is keyed on to the shaft and cut into an octagon or other flat sided form, so that the two halves of the pulley are held tightly in the direction in which they revolve, but have a little lateral play on the sides of the octagon shaped hub, by means of the curved surfaces on which they rest as shown. The rims of the disks or halves of the pulley are doubly curved, so that a flat ring, slightly concave on both sides, lies between them, and forms an almost solid periphery to the pulley. The tension of the rope is on the loose ring, and forces the disks apart at the upper side, thus tending to close them together at the opposite side, holding the loose ring tight, and the rope is held clutched between the disks on the upper side.



A Curious Gum Varnish.

It is well known that the ordinary gum arabic so freely used in photography consists chiefly of the calcium salt of a peculiar acid called "gummic acid." The other salts of the acid are but little known, though the acid itself can be isolated by a process which we shall give presently. Our object in referring to this matter now, however, is to draw attention to a body which appears to be an iron salt, and to possess properties likely to render it of some value.

If we take a solution of gum, and add to it an acid solution of perchloride of iron, no change takes place when the mixture is not exposed to strong light; but if instead of strongly acid solution, we take one which contains as little free acid as possible, and add this to our mucilage of gum, the latter becomes a complete jelly, stiff and strong, immediately on mixture of the two liquids. This jelly has a reddish brown color, and dries up to an even horny layer, very different from gum in appearance. We have coated paper with this substance as follows:—A solution of the liquor of perchloride of iron of the British Pharmacopœia was taken, and to it ammonia cautiously added with agitation until a permanent precipitate made its appearance. The liquid was then filtered, paper saturated with the solution, and allowed to dry in the dark. The coated sheets were then floated on some thick mucilage of gum arabic. The surface of the paper was thus covered with an even layer of the "gummate of iron."

When the paper carrying the iron is first coated with the mucilage, the color does not at once change, but presently a strong, yellowish brown tint is produced, and the gum "sets," and then the layer dries up, leaving the paper very flexible for a long time and highly glazed. When paper so treated is allowed to stand in cold water, a certain amount of the gum dissolves, but a considerable quantity is retained by the iron. The portion but little affected by cold water is, however, easily removed by the hot solvent, some iron at the same time passing into solution. When the gummate of iron paper is exposed to light for some time, the gum is less easily dissolved by hot water, and less affected by cold water, than that which has not been so treated. The paper is distinctly sensitive to light, as most other iron prepared papers are. If washed in water containing a small quantity of ammonia, the brown tint of the paper is increased, and the gum is somewhat less easily dissolved out by water, though, by treatment with a little very dilute acid, the gum and much of the iron can be dissolved out.

The gummic acid above referred to can be prepared by precipitating a solution of gum arabic with acetate of lead, washing the precipitate, and then suspending it in water through which a current of sulphuretted hydrogen is passed Sulphide of lead is formed and gummic acid set free. The latter can then be obtained on evaporating the solution.—*British Journal of Photography.*

Iron as made and used by the Romans in Great Britain.

Mr. W. J. Grover, C. E. states that the Romans, although they had mineral coal at nearly all their stations, and it was not unfrequently met with in their villas in Britain, yet only used charcoal in smelting. In the Roman villa in Britain, vast quantities of iron were used; much more than in an English modern house of similar dimensions. The number and variety of iron keys were truly surprising, and gave an insight into the elaborate domestic economy and housekeeping arts of our early conquerors here. Articles of furniture, though long perished, were indicated by their locks and keys, and must have been a goodly array. There were also found door keys and locks, bolts and hinges, and what was more curious, lifting latch keys, such as are now used in London houses. Then there were padlocks and cylindrical locks, and keys attached to rings to wear on the finger, though these were generally of bronze. Fire dogs of handsome make in iron had been found, showing that fire places had been partially in use in some of the apartments. In addition to the articles already named were found numerous hunting weapons, knives, scissors, and nails of all variety of sizes, not only for building purposes, but for the soles of sandals.

At Chidworth Villa, two large masses or blooms of iron were found, evidently brought to the villa to be worked up, and this was perhaps the explanation of the quantity of iron work generally found. A resident smith was always employed, and when the repairs of locks, keys and farming implements did not keep him going, he no doubt employed his time in working out some of the little ingenious iron devices in rings and keys. The chief locations of the iron industry in Roman Britain were in Sussex in the vast forests, (Anderida, as the locality was then called,) and in the Forest of Dean. Pits from which the ore had been extracted were found in Sussex, together with great heaps of cinders, accompanied with Roman pottery and coins, but it was on the banks of the Wye that the most workings existed. Indeed, that district must have been the primeval "Black Country,"—the dark rich center of smoke, noise and industry. For many miles together the ground was formed of a continuous bed of iron cinder; about Monmouth and Ross must have been the Dudley and Birmingham of Roman Britain. The cinders contained—some of them—from 30 to 40 per cent of metal, and throughout the last 300 years numerous blast furnaces in the Forest of Dean had been supplied solely with Roman scoriæ.

KEEPING FISH FRESH WITH SUGAR.—A method adopted in Portugal for preserving fish consists in removing the viscera and sprinkling sugar over the interior, keeping the fish in a horizontal position, so that the sugar may penetrate as much as possible It is said that fish prepared in this way can be kept completely fresh for a long time, the flavor being as perfect as if recently caught. One tablespoonful of sugar is sufficient for a five pound fish.

Facts about Friction.

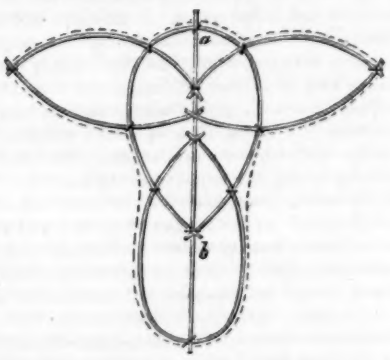
In a new edition of his "Principles of Mechanism," Professor Willis says: The friction of materials in contact with unguents interposed is given as one twelfth of the pressure, and the limiting angle of resistance, 5 degrees; of metals on metals, one sixth of the pressure, with an angle of 10 degrees; of wood on wood, one third of the pressure, with an angle of 18 degrees; and of bricks and stones, two thirds of the pressure, with an angle of 33 degrees.

The magnitude of the friction between a pair of plane surfaces, the one fixed and the other movable, is governed by three principal laws, which have been confirmed by innumerable experiments. The first law is that the magnitude of the frictional resistance between a given pair of surfaces of any materials is proportional to the pressure that keeps them in contact. The second law is that the frictional resistance is unaffected by the area of contact, which may be shown by placing the upper block first flatwise, and then on edge, when the friction will be found to be the same in both positions. The third law is that the frictional resistance of solids is wholly unaffected by the relative velocity of the rubbing surfaces. It is worthy of remark here that the laws of friction of solids and fluids are essentially different with regard to velocity, for while the friction of solids is independent of it, that of fluids increases as the square of the velocity.

It is curious to observe that, taking the mean value of friction at one third of the pressure which generates it, if we take a cylinder of any diameter, as the barrel of a common windlass, and fix it, and throw a rope over it, any weight tied to one end will support a weight about three times as great at the other end. If the rope be taken once round the barrel, and the two ends hang freely down, the small weight will support one twenty-seven times as great at the other end. Thus, with half a coil, as in the first case supposed, the rope will support at one end three times as much as at the other; with one complete coil, nine times as much; with a coil and a half, twenty-seven times; with two coils, eighty one; with two and a half coils, 243; with three coils, 729; with three and a half coils, 2,187; and with four coils, 6,561 times the weight suspended at the other end In drawing water from a well where the depth is not great, or winding up earth from sewer excavations, this property of coil friction is sometimes employed by taking three or four coils of the rope round the windlass barrel. The empty bucket or skip takes the place of the small weight, and the full one that of the greater weight, the coils grasping the cylindrical surface so firmly as to sustain the load. But although the friction of these coils is sufficient to sustain the load, there is a practical difficulty in the method, from want of clearance room, where the buckets or skips pass each other up and down.

The Japanese Bird Kite.

The frame is made of thin bamboo, as in the sketch, and is covered with colored paper. The wings, which are somewhat concave, and fall back a little, are dark maroon, and



the body and tail represent a Japanese lady. Small white twine is used. By various devices, the hovering and soaring of a hawk can be admirably imitated. Length of middle cane 20 inches, spread of wings 26 inches; *a b*, points where the "belly band" must be attached. Dotted lines show the paper.

Orris Root.

The following is an abstract of a paper read before the British Pharmaceutical Conference, at Brighton, by Henry Groves, of Florence:

A small district round the city of Florence seems to be at present the chief, if not the only, source of orris root. The plants yielding it are *Iris florentina, I germanica, I pallida*, and the scraped rhizome is the portion of the plant which occurs in the market as orris root. Large quantities of these roots are used by perfumers, for the purpose of blending with other essences, and it is also largely used for tooth powders, and for the composition of what is commonly known as violet powder. A discussion arose as to whether orris root contains any essential oil. Mr. Haselden stated that he had frequently endeavored to obtain this oil by distillation, but had failed to do so. Mr. Umney, London, stated that he had distilled many tuns of the root, and had obtained the essential oil in the form of a fatty substance, similar to cacao butter. This substance was yielded in very small quantity, and was even more costly than otto of roses; it possesses all the fine aroma of the original root.

RECIPES AND EXPERIMENTS.

The following recipes and experiments have not been practically tested by the editor of the SCIENTIFIC AMERICAN, but are published for the benefit of readers who may desire to try them. The editor would be glad to be informed of the results of such trials.

WASHING COMPOUND.—The use of soda for washing linen is very injurious to the tissue and imparts to it a yellow color. In Germany and Belgium, the following mixture is now extensively and beneficially used: 2 lbs. of soap are dissolved in about 5 gallons water as hot as the hand can bear it; then next is added to this fluid, three large sized tablespoonfuls of liquid ammonia and one spoonful of best oil of turpentine. These fluids are incorporated rapidly by means of beating them together with a small birch broom. The linen is then soaked in this liquid for three hours, care being taken to cover the washing tub by a closely fitting wooden cover. By this means the linen is thoroughly cleaned, saving much rubbing, time and fuel. Ammonia does affect the linen or woolen goods, and is largely used as a washing liquor in the North of England.

GOLD POWDER.—Gold powder for gilding may be prepared by putting into an earthen mortar some gold leaf, with a little honey or thick gum water, and grinding the mixture till the gold is reduced to extremely minute particles. When this is done, a little warm water will wash out the honey or gum, leaving the gold behind in a pulverulent state. Another way is to dissolve pure gold, or the leaf, in nitro-muriatic acid, and then to precipitate it by a piece of copper, or by a solution of sulphate of iron. The precipitate (if by copper) must be digested in distilled vinegar, and then washed (by pouring water over it repeatedly) and dried. This precipitate will be in the form of a very fine powder. It works better and is more easily burnished than gold leaf ground in honey as above.

CEMENT FOR MARBLE AND ALABASTER.—According to Ransome, the following mixture affords an admirable cement for marble and alabaster: Stir up to a thick paste, by means of a solution of silicate of soda (water glass), 12 parts Portland cement, 6 parts prepared chalk, 6 parts fine sand, 1 part of infusorial earth. An irregular piece of coarse grained marble was broken off by means of a hammer, and the surface coated by a brush with the above paste, and the fragment inserted in its place. After 24 hours it was found to be firmly set, and it was difficult to recognize the place of fracture. It is not necessary to apply heat.

FRENCH PUTTY.—Seven pounds linseed oil and four pounds brown umber are boiled for two hours, and 62 grammes wax stirred in. After removal from the fire, 5½ lbs fine chalk and 11 lbs. white lead are added and thoroughly incorporated. This putty is said to be very hard and permanent.

INK FOR ZINC LABELS.—A correspondent of the *Country-Gentleman* recommends the following as an ink for zinc only, that will endure for years, cuts slightly into the metal, has a black color, and is as legible after a dozen years as when newly written: "Take one part verd gris, one part sal ammoniac, half part lampblack, and ten parts of water; mix well, and keep in a bottle with glass stopper; shake the ink before using it. It will keep any length of time. Write it on the label with a steel pen not too fine-pointed. It dries in the course of a minute or two."

DEATH OF MR. W. H. SEWARD.

William Henry Seward, whose public and political career has extended over the last fifty years, and who has served his country in many capacities, having been a Senator for many years and twice appointed Secretary of State, is no more. His high character gained him the respect of all classes of politicians: and the vigorous courage which distinguished him through life remained with him to the last. So recently as 1871, when in his 70th year, he made a tour round the world, although he had hardly, when he started, recovered from the attempt on his life by the assassin Payne, in 1865. Mr. Seward died at his home in Auburn, N. Y., in the 73d year of his age, on Oct. 10th.

INK PLANT.—Botanists are endeavoring to introduce and acclimate in Europe a plant of New Granada, which will be a valuable acquisition to manufactories of ink. The juice or sap which it yields, and to which is given the name of *chanhi*, is at first of a reddish tint, but in a few hours becomes intensely black. It may be used without any preparation. The *chanhi* corrodes steel pens less than ordinary ink, and better resists the action of time and chemical agents. It is said that, during the Spanish domination, all public documents were required to be written with this ink; written otherwise, they were liable to damage by sea water.

ADVANCE IN THE PRICEOF WINDOW GLASS.—The principal makers of the above material in the midland districts (England) have issued circulars stating that it is necessary, in consequence of the increase in the cost of fuel and other materials, to advance the price of window glass. They state that for the present the net price for "fourths" crown will be 42s. per crate; and the quotation for "thirds" 15 ounce sheet, glazing quality, is 4½d. per foot, less 25 per cent discount.

BRANDY FROM MOSSES AND LICHENS.—In Russia, alcohol and brandy is now largely manufactured from mosses; the quality is said to be exceedingly good, and many distilleries are making profits of 100 per cent by this novel industry.

Correspondence

The Editors are not responsible for the opinions expressed by their Correspondents.

The Dangers of Car Coupling.

To the Editor of the Scientific American:

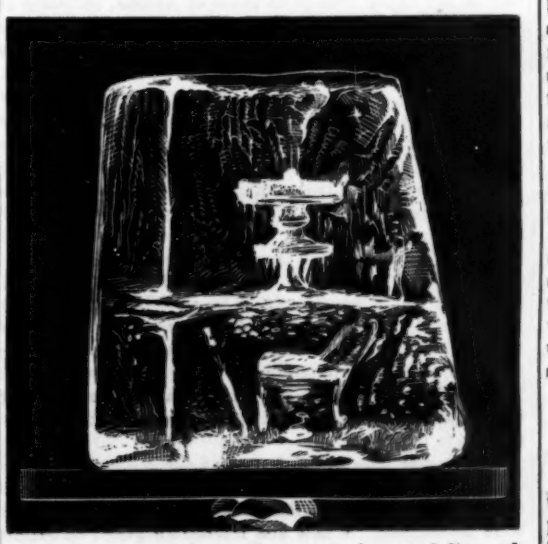
Your issues of Sept. 21st and Oct. 5th contain articles on the above very important subject. I have myself been one of that class of railroad employees, so much worked and so little paid, having filled the positions of switchman, brakeman on both freight and passenger trains, fireman, and conductor during a period of eight years or longer. I affirm that every thinking man who knows anything at all of railroading practically will agree with me in saying that the man who fills the position of switchman or car coupler, freight brakeman or conductor carries his life in his hand. To talk of "getting on the platform to couple" is like describing an object as about the size of a piece of chalk; one conveys as much information on the subject as the other, being equally indefinite. Everybody knows that not one freight car in ten thousand has a platform, and there is so little coupling and switching of passenger cars as to render an automatic or self coupler almost unnecessary. There are perhaps ninety-nine couplings to be made with freight cars where there is one with coaches. And the danger of coupling is, in the estimate of many, not as great as the danger of uncoupling, especially when making a "running switch", as it is often necessary for a man to climb down between cars with no ladders on either end. Take a situation like this, for instance: The brakes are on opposite ends of the cars, and there are no ladders on the end of either car; so a man, while pulling the pin, is obliged to stand on the dead wood without anything to hold to, and after pulling the pin, has hard work to get back to the deck of the car. Suppose, as has been the case, the engineer pulls out, or the motion of the train causes the cars to separate prematurely; what is to keep the man from falling on the track and being run over? Or say that a coupling is to be made between a box and a flat car, the flat one having lumber or railroad iron projecting; it is then necessary to stoop the head, or, as has been the case many times, have it crushed. If a man gets on the inside of a sharp curve with ladders of both cars on the ends and same side on which he stands, and there be a number of cars both next to the engine and in rear of him, so it becomes a difficult matter for the engineer to hold the cars, should the springs on the drawheads be a little weak, ten to one that he will get a squeeze, or worse. Now these are no imaginary situations, but a few of a great many in which your correspondent has himself been placed, so that he can sympathize with those who are compelled to daily risk their lives or, in the language of a great many officers who control the situations, "quit". There have been automatic couplings invented which would fill the bill as to cheapness and utility, and that would not necessitate the removal of all the draw heads on a road at the same time; and besides they have been practically tested by daily use on the road. Such a one I have seen, and know that the only reason why it has not been put into general use can be found in the sentiment, which many railroad presidents, superintendents and directors entertain, that poor men at $40 per month are cheaper than patent couplings. This will no doubt be their opinion on this subject until legislation shall compel the adoption of life-saving apparatus for the coupling of all railway cars.

Cincinnati, Ohio. D. M. S.

A Curious Ice Picture.

To the Editor of the Scientific American:

Inclosed please find photograph of a cake of ice delivered in the ordinary course of trade to one of our citizens. It was cut, with other ice, in the Wabash and Erie Canal in this place. You will notice that there is a well delineated outline of a cake basket, which resembles frosted silver; some



likened it to a fountain sending up a shower of diamonds. The photograph gives but little idea of the beauty of the real thing, only an outline of the form. No foreign body was present in the ice, and the query is, what produced this particular figure? You or some of your contributors will probably be able to enlighten us through your paper.

C. A. MCCLURE.

Delphi, Ind.

AMONG the industries of Waterloo, N. Y., now rising into importance, is that of manufacturing yeast cakes, 80,000,000 of which were made last year.

August Meteoric Showers.—Do They Come from the Sun?

To the Editor of the Scientific American:

A considerable number of meteors were seen here on the evenings of the 11th, 12th, and 13th of last August, but unfortunately the evening of the 14th was so cloudy that we saw none, though most probably many fell. Several friends and I made a point of watching them from the evening of the 8th to that of the 15th. We saw none on the evening of the 15th.

Four years ago (August, 1868), I saw them also fall during several nights in succession. Then they seemed to move in every direction; but this year all we saw moved northwardly, or nearly so.

Some scientists have supposed that the earth passes through what they call a "meteoric belt" on the 14th of August, and others have imagined that it passes through the wake of some comet; but how those men can account for the velocity of the sun and the regularity of the August meteors is rather puzzling to me. I believe the August meteors come from the sun. Let me explain my notion:

Suppose the sun to throw out meteors to a distance from him of say 100,000,000 miles; the earth, in the return half of her orbit, will, as it were, meet the sun and pass through the meteorites when about half way. Thus, the earth will be crossing the sun's wake about the 14th of November; she will be up to, and, as it were, on the right side of the sun about the 12th of February, and she will be direct before the sun before the middle of May; and on the left side of the sun about the 12th or 14th of August.

The August meteors are as regular as are the November ones, and to no other source can we consistently ascribe their origin but the sun. Admit that, and we can account for all the meteors which fall throughout the year, regular as well as irregular, in all lands, and at all seasons. Contend that they fall from a meteoric belt, or from the wake of a comet, and we have either to suppose the sun standing still in space, or that the meteoric belt, or the comet's wake, is moving along with him at the same exact rate, which does not seem possible.

The above theory is at least plausible, and the probability is that it is nearer the truth than either of the others.

Gloucester, N. J. JOHN HEPBURN.

The August Meteors.

To the Editor of the Scientific American:

I was at Knoxville, Tenn., on August 10, and between ten and eleven o'clock, P. M., I think there were more meteors fell than I have seen in the previous 35 years; I think many persons will corroborate this, and I have heard a number speak of seeing a few more on the 11th, and also some on the 12th.

About a week previously, there was a fine display of the aurora borealis, visible at Knoxville. It was of a red color. It is unusual to see this phenomenon so far south, and it was pronounced at once to be a sign of coming war and bloodshed. It pained me to see the apprehension which the people in that part of the country felt.

I have lived in this State over 30 years, and I have often seen auroral displays of a red color, but never so fine a one at midsummer as the one at Knoxville.

Detroit, Mich. JAMES E. RANKIN.

Propelling Canal Boats.

To the Editor of the Scientific American:

In your issue of October 5, 1872, an individual, signing himself "Voyageur," gave an idea in regard to propelling canal boats which proved not, as he supposed, original. The side swells, instead of amounting to very little or nothing as he would have us suppose, are the most difficult obstacle that the inventor has to overcome. We know that a propelling screw would not create waves as large as those produced by the boat plowing or displacing the water in front; and if an inventor can succeed in destroying the latter, the waves from the propelling wheel or screw can be levelled by the same device. It should be borne in mind by every inventor that what is wanted is something to keep the waves from reaching the banks, and not, as a great many suppose, something to propel the boat.

My idea for destroying swells is to have false sides, running from the bow or stem (not curved with it, but straight) to about five feet past the stern and two feet or more from the side of the boat. Let them extend three feet under water, and the same above. At the stern, where they project, have a coarse cloth fastened from one to the other, dragging in the water between them. The false sides would carry the waves from the front and paddle wheels (if they should be used instead of a screw) to the stern, where they would be swept down by the cloth. J. A. D.

Franklin, Pa.

Small Fast Side Wheel Steamers.

To the Editor of the Scientific American:

I am building a miniature side wheel steamboat, calculated to draw 6 inches of water, and to run at the rate of 8 miles per hour across current with engines open. Her length is 35 feet, width 6 feet, with the bottom flat, and she is bilged from water line up; her side wheels are 5 feet in diameter. Her engines have 2 cylinders, each 3½ inches in diameter with 5 inches stroke, linked in locomotive style, and placed at an angle of 20°. The cylinders are near the bottom of the boat, and the crank shaft is geared to the wheel shaft, making 300 revolutions to the wheels' 100. I think that, for small side wheel steamers requiring fast steady running, gearing the engines direct to the wheel shaft, as above stated, is far superior to the beam engine referred to by your correspondent in your number of the 5th instant. J. W. SHEETS

Harrisburg, Pa.

[For the Scientific American.]

Death of Mr. E. B. Horn.

Mr. E. B. Horn deserves more than a passing notice. He was one of the most ingenious mechanics and finest workmen we had in this country. Associated with Mr. Daniel Davis, Charles G. Page, and others, in their early experiments in electro-magnetism, he has constructed probably a greater variety of electro-magnetic engines than any other man in the world.

For several years he turned his attention to electro-magnetism as a motive power, and so early as 1835–6 was exhibiting an electro-magnetic engine which turned a lathe. He had also an electro-magnetic locomotive, with car attached, which, for a small pecuniary consideration, carried passengers at the various places in which the invention was exhibited. After many years expenditure of time and money, he finally abandoned the idea of ever obtaining power from electro-magnetism.

He was a most remarkable workman, and could do the most difficult work, and that, apparently, without tools. When a young man, he constructed a perfect watch (a fair time keeper), the materials of which consisted solely of sheet tin, solder, and iron wire. His friends used to say "he could make anything, from a watch to a locomotive." During the latter part of his life, he was engaged in the repair of clocks and watches of the most difficult and intricate construction.

He was modest and retiring in manners, being one of the old school mechanics. In his death, we have lost a worthy man, one regretted by all his friends and one whose place will not be easy to refill.

The greater part of his life was spent in Boston, Mass.

T. H.

THE VIENNA EXPOSITION BUILDINGS.

The *Engineer* publishes the following details relative to the magnificent buildings which are now being prepared for the great exposition in Vienna. The chief structural materials to be employed are stone, brick-work, zinc, glass, and wood-work. The great central rotunda, in which the choicest objects will be displayed, springs from the ground a circular façade of piers, of no less than 426¼ feet in diameter. Above this rises the immense roof, surmounted by a lantern of cast iron and glass, the diameter of which is 105 feet. Above the latter is a second lantern, and then a cupola, the extreme hight of the finial being 300 feet. The vastness of these dimensions may be judged from the fact that the domes of St. Peter's in Rome, or St Paul's in London, or the steeple of Trinity Church in New York, might be easily set down within this enormous concave without nearly touching it anywhere. Access will be provided to the summit, from which an extended view of the city and adjoining country will be gained.

At three sides, the quadrangle round this central hall will consist of continuations of the exhibition galleries, but the fourth or north east side of it will be reserved for offices and administration rooms. There will be six grand entrances, of most imposing architectural design, and twenty-eight smaller entrances through the long sides of the structure. The great central quadrangle of lateral and transverse galleries will be about 755 feet square externally, and the total length of the grand central spine, 2,985 feet. The width of the latter will be 82 feet and its hight 52½ feet. All the galleries in both directions consist of brick walls to about half the hight, stuccoed into a bold sort of paneling exteriorly, between recurrent piers which rise to the hight of a frieze running the entire length. The space between the top level of the brick work and the frieze is glazed, the whole of the light being derived from the sides.

The building set apart for machinery is of brick, and is 2,614 feet long and 155 feet wide. Several boiler houses are annexed, and water and steam are laid throughout the structure. Connecting with two lines of rails within this building and with nine other tracks extending the whole length of the exposition, is the North of Austria railway, so that exhibitors will thus be enabled to bring their goods, without the risk of unloading, right up to the very point of location. There are four grand entrances to the machine hall. Sewerage is provided along its entire length, and, in addition to the supply of water laid along at high pressure, well water may be obtained at any desired spot by sinking to about ten feet below the surface.

The next most important building in point of size will be the picture and sculpture gallery of which the projected dimensions are 575 feet in length by 80 feet in width. It is thoroughly fireproof and is protected by every safeguard against dampness. The great barrack, constructed for no less than sixteen hundred of the Austrian sappers and miners with their engineer officers, is no great distance off, and the most careful watch, day and night, has been arranged against any accident happening to the treasures with which the picture gallery will be filled.

For decorative purposes, a new material has been found and largely applied, which is said to possess great capabilities and beauty as well as remarkable cheapness. It is a coarse cloth woven from jute, upon which the means have been discovered for printing in colors, gilding, etc., so as to relieve the naturally fine straw color of that fiber; and surfaces wholly or partially covered with this material are said to show as much charm in beauty as in novelty.

Anti-Sea-Sick Steamers.

Mr. E. J. Reed, the late Chief Constructor of the Navy, is now engaged on plans for building for the Channel passage two ships of 350 feet in length, propelled by engines of 5,000 indicated horse power and capable of performing a distance of 20 miles per hour, for the purpose of testing the practicability of Mr. Henry Bessemer's new Channel scheme. His plan is to place the engines, etc., in the fore and aft parts of the vessel, and in the center to fix a hanging saloon, oblong in form and of dimensions 20 feet in length, 30 feet in width, and 20 feet in hight. For maintaining the level and to avoid any rolling motion to this saloon, Mr. Bessemer has contrived hydraulic apparatus to which are attached a pair of delicate equilibrium valves, and by watching a spirit level a man can, by a slight movement of a rod resembling the handle of a letter-copying press, control the slightest oscillations of the saloon with the greatest ease. It is expected that passengers can be conveyed across the English Channel in these swinging saloons without experiencing the dreadful qualms of sea sickness. An engraving of a swinging saloon for vessels, the invention of L. D. Newell, of New York, will be found in the SCIENTIFIC AMERICAN of May 21, 1870.

[From the American Journal of Science and Arts.]

The Nature and Duration of the Discharge of a Leyden Jar.

When the primary coil of an inductorium is connected with a voltaic battery, the act of interrupting the connection, as is well known, produces a current of electricity in the secondary coil, which can be accumulated in a Leyden jar, and then discharged by a spark. Now it is possible to adjust either the electrical surface of the jar, or its striking distance, so that, with a given coil, only a single spark will be produced each time that the battery circuit is broken; but in the great majority of cases, it will happen that enough electricity will be generated to charge and discharge the jar a number of times. The circumstance that electricity is continuously furnished by the coil during the fraction of a second, is favorable to the production of these multiple discharges, has been demonstrated by Professor Rood in a number of experiments; from which it also appears probable that an in increase in the striking distance is accompanied by a corresponding increase in the interval between the sparks composing the multiple discharges, though upon the whole it shortens the total duration of the act, by diminishing the actual number of discharges.

Still Later Intelligence from the Moon.

Mr. Birt, at the last meeting of the British Association, dealt with the observation of the spots on the floor of the crater Plato. It appears that changes in the appearance and luminosity of the streaks have been detected, and these changes are of such a character that they cannot be referred to changes of illumination, but depend upon some agency connected with the moon itself, while the color of the floor was found to vary as the sun ascended the lunar heavens, being darkest with the greatest solar altitude. The reports indicate a strong probability that definite changes of an interesting character on the moon's surface will be discovered.

The Aurora Australis.

The aurora australis was visible at Melbourne, Australia, on the evening of April 11th. The streamers disappeared after about half an hour, leaving a deep red glow reaching an altitude of about 60°, which gradually grew fainter until it faded entirely away. Slight coincident magnetic disturbances were noted.

A New Organic Base.

Bouchardat has succeeded in obtaining a new organic base, containing oxygen, by acting upon one part of dulcite monochlorhydrin with ten parts of alcohol saturated with ammonia gas for six hours at 100°. The chlorhydrate of the new base is termed dulcitamine; its formula is $C_6H_{15}NO_5$, and it resembles glyceramine in many of its properties. Its discovery furnishes a new proof of the close relations between the triatomic alcohol, glycerin and the hexatomic alcohol, dulcite.

A New Fossil Bird.

The skeleton of a fossil bird, found during the past summer in the upper cretaceous shale of Kansas, indicates an aquatic bird as large as a pigeon and differing widely from all known birds in having biconcave vertebræ. The species is termed *ichthiornis dispar*.

New Tertiary Reptiles.

The localities where the following new forms of vertebrate life were found are nearly all in the eocene beds of the Green River basin, first examined by the Yale party in 1870. We select several of the most interesting species from the detailed descriptions given. The *Thinosaurus paucidens* belongs to a genus including a number of large carnivorous lizards. The limb bones preserved resemble those of the iguanas. The remains of the species indicate an animal about four feet in length. The *Thinosaurus grandis* is a gigantic lizard, probably not less than seven feet in length and three or four times the bulk of *Iguana tuberculata*. Another member of the lizard family is the *Glyptosaurus princeps*. The entire body of this reptile was covered with ornamented osseous plates, most of them united by suture. It was about six feet in length.

Three other species of the genus *Glyptosaurus* were also discovered. Of another genus, *Oreosaurus*, which is considered nearly related to that above referred to, five species were determined. A new and interesting genus of extinct lizards, the *Iguanavus exilis* has been predicated upon a number of vertebral and a few other isolated specimens, found in the eocene of Wyoming, which belonged to animals of about two feet in length. The *Limnosaurus ziphodon*, it has been determined, belongs to a genus quite distinct from the modern *Crocodilus*, the teeth differing widely from those of any known species of the latter.

PROFESSOR BAILLARGE, whose stereometrical tableau was illustrated in this paper on June 1, has been made an honorary member of the Society for Generalization of Education in France.

[From the Boston Journal of Chemistry.]

A Curious Optical Experiment.

By passing a current of sulphurous acid gas through a solution containing selenium (I used seleniate of potash), a beautiful pink precipitate is formed, which, while suspended in the liquid, gives to it a light green color by transmitted light, but a beautiful pink by reflected light. I have never seen this circumstance mentioned in print, although a similar phenomenon in the case of the aniline colors is well known. If a strong alcoholic solution of rosaniline is poured upon a watch glass or piece of mica, and evaporated to dryness, the thin scale of aniline is rose red by transmitted light, cantharidis or beetle green by reflected light. A solution of iodine green, very carefully evaporated at a low temperature, becomes copper red by reflected light, bluish green by the transmitted light. If, in preparing the iodine green, too high a temperature is employed, the green is converted into a purple.—*E. J. Hallock.*

Preservation of Wood by Kyanizing.

We were much interested in examining, at the late New England fair, held at Lowell, some specimens of wood exhibited by the proprietors of locks and canals on the Merrimac river. There were twelve different kinds of wood from the valley of the Merrimac, representing the following varieties: 1. Old growth White Pine; 2. Sapling White Pine; 3. Northern Hard Pine; 4. Spruce; 5. Hemlock; 6. Beech; 7. Black Birch; 8. Yellow Birch; 9. Rock Maple; 10. White Maple; 11. Brown Ash; 12. Poplar. They were sawn out in the summer of 1872, at the mill of Messrs. Norcross & Saunders, in Lowell.

Each stick was originally about eighteen feet long and nine inches square. Each was subsequently cut in two; one half was kyanized, and the other half returned in its natural condition. In April, 1863, the whole were set out together as posts, about one half their length in the ground, in dry gravelly soil, fully exposed to sun and weather; and they so remained until taken up, August 28th last, to be exhibited.

On examination of the specimens, it appeared that the kyanized halves showed scarcely any signs of decay, while those not kyanized were all more or less decayed, four of them, namely, rock maple, poplar, hemlock, and old growth white pine, so much so, that at the level of the top of the ground they had come apart. The spruce, Northern hard pine, and sapling pine were also considerably decayed, but held together. The beech, black birch, yellow birch, white maple, and brown were all somewhat decayed, but less than the others.

Kyanizing consists in soaking the wood in a dilute solution of corrosive sublimate. The process takes its name from the inventor, John H. Kyan, a native of Dublin, who died in 1850. It has long been considered the most efficacious method of preserving the timber of ships from dry rot.

Adulterated Cream of Tartar.

We have recently had brought to us two or three specimens of cream of tartar that were sold as perfectly pure. On examination, these were found to contain upwards of 25 per cent of gypsum. This impurity is easily detected, as pure cream of tartar is soluble in hot water, while gypsum is nearly insoluble. Therefore, if half a teaspoonful of the suspected article is put into a tumbler, and hot water poured over it, it will leave a white sediment if it contains gypsum, but will be totally dissolved if pure. It is well to observe in this connection that very little saleratus is now sold, the article commonly known by that name being supercarbonate of soda or "baking soda," as it is often called. We were amused, the other day, at hearing an order given in a grocery store for "one pound of baking soda and half a pound of saleratus." The baking soda was taken from a box containing it in bulk and the "saleratus" was supplied from some brand, that came done up, in paper. Both were really the same article, and sold at the same price. True saleratus is a sesquicarbonate of potash, and is more expensive than the soda salt.

NEW LINE OF ATLANTIC STEAMERS.

The Glamorgan is the pioneer vessel of a new line of steamers about to be established between Cardiff, Wales and New York, by the South Wales Atlantic Steamship Company. The Marquis of Bute, a peer noted for his enormous wealth, has interested himself greatly in the enterprise, and has granted it very extensive concessions, among which are the remission of all dock dues in the Cardiff docks for the space of one year, and the free coaling of the steamer for a similar period at the collieries owned by him. The Glamorgan is a big rigged screw steamer, and is fitted with all the improved marine appliances. Telegraphic arangements permit of instant communication between the captain and the helmsman, and a patent apparatus furnishes gas for the illumination of the vessel, at the rate of several thousand feet daily. The interior appointments of the ship contain every comfort and luxury, and provide accommodations for 700 passengers. Her tunnage is 2,500 tuns registered, with engines of 1,800 actual horse power.

THE discovery of coal beneath the Permian foundation in the neighborhood of Birmingham is likely to be followed by a similar discovery in the western portion of Lancashire. Mr. Edward Young, of Doughtybridge, who has surveyed and explored the district, is of opinion that there is a coal field of between 400 and 500 square miles, commencing near Southport, and extending to Liverpool one on the side and Lancaster on the other.

DESTROYING CATERPILLARS.—According to Schmidt, a remedy against caterpillars consists of 1 part of sulphide of potassium and 500 parts of water. Syringe the tree or plant with the above.

A Sensitive Water Fall.

BY PROFESSOR EDWIN J. HOUSTON.

The recent developments of acoustics have been rich in their revelation of the wide spread influence exerted by sound waves in shaping and molding matter, when in a condition to easily allow the movement of its particles. The eye as well as the ear can now be appealed to to detect the presence of these invisible waves. At their touch light sand strewn over these membranes is heaped up in miniature hills, with even greater precision and regularity than by grosser waves by the sea shore, the number and order of the hills, together with the relative size of their interlaying valleys, not only witnessing the work of the sound waves, but also indicating their exact nature and number. Water jets, gas jets, smoke jets and flames of most all gases are also under favorable circum stances likewise affected, changing their shape, size, direction and general appearance, in the most curious manner. So delicate, indeed, are some of these methods that waves, too feeble to allow of translation by the ear into sound, are instantly appreciated by the eye as motion.

There are many different ways in which sound waves can thus reveal their presence to the eye; we have sensitive waves both covered and naked, smoky and clear, silent and noisy; we have sensitive jets of gas, water and smoke, and many other instances of this kind of sensitiveness that will recur to the student of acoustics. I propose to add another, of quite a novel character, to the already lengthened list.

While spending a summer's vacation in Pike County, Pennsylvania, I had the good fortune to discover the sensitiveness of water to sound waves on a large scale. Among the many beautiful waterfalls in this portion of our State, I visited one in which a scanty supply of water was dripping from the moss covered walls of a precipice. Each stream poured from the end of a pendant of moss, formed generally of one or two tiny leaflets. The air was unusually still, and the streams preserved for some distance a vein remarkably free from ventral segments. Struck with this circumstance, it occurred to me to try the sensitiveness of these streams to the notes of the voice, and after several attempts I found a tone, a shrill falsetto, to which they would respond. On sounding this note, the grouping of the drops and the position of the ventral segments were instantly changed. As the streams were of different diameters, they were not all sensitive to the same note; but at one portion of the fall's, from which about one hundred of these thin, delicate streams were dripping, a very large number of them responded. A friend who was with me, a gentleman of nice powers of observation, noticed the same phenomena.

I was unable to determine the exact conditions of success, but am satisfied that they are not easily obtained, as at several other falls, where the streams appeared nearly of the same character, none were found that would respond to the voice, although a variety of different tones was tried. At other falls, however, a number of streams were found that were almost equal to the first in sensitiveness.

A heavy rain, which flooded the streams, prevented me from extending the observation. The publication of the facts will enable others to try the experiments for themselves.

The change in the grouping of the drops and the position of the ventral segments is, no doubt, to be ascribed to a vibration communicated by the sound waves to the delicate filaments of moss from which the water flows. These act somewhat in the manner of reeds, and simulate the orifice of the ordinary sensitive jet, by whose vibration the appearance of the issuing stream is altered.

The falls at which the observation was first made are situated on Adam's Brook, near Dingman's Ferry, about two and a half miles up stream from the stage road leading to Milford. —*Journal of the Franklin Institute.*

Economical Portable Engines.

A novel form of portable engine, built by Messrs. Davey Paxman & Co., has recently been tested at Cardiff, Wales, and, it is stated by the *Engineer*, performed admirable duty and was highly commended by the judges. The boiler is of the usual portable engine type, but improved by the addition of ten tubes, which serve to augment the fire box surface, break up and mix the gases on their way to the flues, and also promote circulation in the fire box and over its roof. The regular evaporation may be taken as over 10 pounds of water per pound of coal, as, on the occasion of the trial, the engine (8 horse power) evaporated 1,675 pounds of water with 168 pounds of coal.

There is a peculiarity about the valve gear which is worthy of notice. The ordinary slide valve, worked by an eccentric, is employed, but in the lid of the chest, slots are made on which works a grid valve with corresponding apertures. This valve has a throw of not more than one fourth of an inch, and is actuated by a crank on a long rod. The end of the latter is a bowl of hardened steel which takes against two cams on a sleeve on the crank shaft. A powerful coiled spring near the end of the rod pushes it forward and shuts the valve; and the sleeve on which the cams are fixed is traversed back and forward on the crank shaft by the action of the governor. When the latter is open, the narrow ends of the cam plates take the end of the rod, keeping the valve open for one tenth of the stroke; when the balls fall down, the sleeve traverses on the shaft and the bowl runs to the wide end and the valve remains open for about one half stroke. The grade of expansion is thus regulated with great precision by the governor. The gear makes no noise when at work, excepting a slight clicking sound; and, it is of great durability, as, after a months running, it showed no signs of wear, although the cam plates were only of wrought iron hardened with prussiate of potash.

The Utilization of Tide Power.

This question has been discussed lately in several quarters, and amongst others, Mr. Bramwell, in his address delivered as President of Section G of the British Association during the meeting of that body at Brighton, has directed special attention to it.

The plan which he suggests, says *Engineering*, is that advantage should be taken of the natural configuration of the coast in certain places to form storage reservoirs, from which the water might be discharged at low tide, and made to work turbines, which should in their turn drive pumps employed in pumping water into hydraulic accumulators. From these accumulators the water, under a high pressure, is to be distributed to the places where it is wanted to drive machinery.

At first sight this appears to be a very plausible idea; but a more careful examination of the features of the case shows that although plausible, it is by no means promising, except under certain unusually favorable conditions. To explain this it will be as well, in the first place, to show the cost of the power producer with which the tide motors will have to compete.

We do not hesitate to say that at the present time no mill engine of any size should be consuming more than 2½ lbs. of coal per horse power per hour. We are quite aware that there are thousands of stationary engines which are consuming more than double this; but this fact does not affect the question, as tide motors, if they are to be successful, must be able to compete with engines of an economical type. Again, allowing for holidays and other stoppages, an ordinary mill engine has to run about 2,800 hours per annum, and, taking the consumption at 2½ lbs. per horse power per hour, this gives the annual consumption per horse power as 2,800×2·5 —7,000 lbs., or allowing for lighting up, etc., say 3½ tuns. The present price of coal is abnormal, and does not, therefore, form a basis for such calculations as those to which we are now directing attention; and taking into consideration the fact that tide-motors, if successful, would themselves tend to produce a reduction in the price of coal, we think we shall be treating them liberally if we estimate the average cost of the coal with which they would have to compete at 16s. per ton. Taking it at this price, we should have the average cost of fuel per horse power for a really good engine—3½×16—56 shillings, or £2 16s. per annum; or for a thousand indicated horse power, an annual cost for fuel of £2,800. Besides saving fuel, the tide motor would also render unnecessary the boilers at present employed, and there is, therefore, to be placed to its credit the cost of maintenance of these boilers, the interest of the capital sunk in them, and the stokers' wages. For the thousand indicated horse power which we are taking as our example, these items would probably amount in the aggregate to about £800, thus giving, say, £2,800 + 800—£3,600, as about the annual sum which a mill owner would be justified in paying for a supply of water capable of developing 1,000 horse power during ordinary working hours. The cost of engine superintendence, oiling, etc, and miscellaneous charges, would probably be about the same, whether steam or hydraulic engines were used, and these matters, therefore, need not be considered here.

Let us now examine the other side of the question. The annual charges, to which an establishment for utilizing the power of the tides would be subject, would be the interest on the money expended on the works and machinery, the cost of maintenance, and the expense of superintendence, collection of rates, wages of sluicemen, etc. In the aggregate these charges could scarcely be estimated as amounting to less than 15 per cent on the capital expended, and in the case of an establishment supplying power in moderate amounts over an extended district, it would probably be even more than this. Taking, however, the annual charges as amounting to 15 per cent on the capital, and taking, also, the yearly rent which might probably be paid for a supply of water capable of developing 1,000 horse power as £3,600, we find that the capital which it would be justifiable to expend on tidal works capable of supplying that amount of power would be £24,000, a sum which, we venture to say, would in but exceedingly few instances suffice for their execution.

It must be remembered that the expenditure of say £24,000 for each 1,000 horse power which the tidal works would be capable of supplying to factories would have to include not merely the construction of the storage reservoirs with its sluices, etc, but also the cost of the turbines, pumps, hydraulic accumulations, and last—but by no means least—that of the pipes by which the water under pressure would be conveyed to the works where it could be utilized; and hence, as we have said, we believe that there are very few situations where the requisite works and plant could be provided for the sum which it would be justifiable to expend.

Surface Friction in Water.

The results of several experiments made by Professor W. Froude may be approximately stated in brief, as follows:—

1. As regards the relation of resistance to speed. With the surface coated with shellac varnish, Hay's composition, Peacock's composition, or tallow, the resistance varied very nearly as the power 1·83 of the speed; with the surface coated with tinfoil, very nearly as the power 2·05 of the speed; but the experiments with the tinfoil are not yet complete.

2. As regards the relation of resistance to quality of surface With the surface coated with shellac varnish, Hay's composition, Peacock's composition, or tallow, the resistance differed extremely little, such variations as occurred scarcely exceeding one per cent, and being probably not greater than belonged to the small differences of smoothness in the laying on the composition.

With the surface coated with glue, and thus simulating the sliminess of a living fish, three successive experiments were tried at the same speed, so as to test the effect of the gradual growth of the slimy character. The first experiment showed an increase in resistance of two per cent, the last of four per cent, as compared with the shellac surface which the glue resembled before immersion, a proof that the attempted imitation of the fish's surface was not advantageous.

Comparing a tinfoiled surface with one coated with shellac, when the length is one foot, the resistance of the former is on the average only two thirds that of the latter; making the comparison with planes of 1 6 in length, the ratio is three fourths; and with planes of 16 feet, more than nine tenths, instead of two thirds; indeed, the total difference becomes progressively less as the planes compared are longer. At higher speeds also the difference tends to become less, in consequence of the higher power of the speed to which it is proportioned with the tinfoiled surface.

3. As regards the relation of resistance to length of surface. There plainly is a very considerable diminution of average resistance per square foot as the length of surface is increased, and this probably from the cause already indicated, though the rate of diminution becomes gradually less as the surface becomes longer; there is, in fact, as great a diminution between three feet and four feet of length as between 30 and 50.

Manufacture of Carbonate of Potash.

In France, carbonate of potash is manufactured from the residues of molasses after fermentation. After taking out the sugar, or as much as possible, and fermenting the uncrystallized sugar, the residuum from the fermentation (*vinasse*) is evaporated and calcined, and the different salts separated in a very complicated manner. The principal product of this manufacture in the end is carbonate of potash, an extremely valuable article; but up to some years ago it was not possible to obtain that article in sufficient purity by this process, particularly owing to the presence of the cyanides. The cyanide of potassium was in itself a most disagreeable ingredient if it was not completely destroyed, and in trying to destroy it, the result was that carbon was formed in the modification of graphite, and it was quite impossible to burn the potash sufficiently white. It had a gray color, and was not marketable, or rather only marketable at a very low price. The furnaces are calcining furnaces, and are constructed rather differently from our carbonating furnaces. The working door is exactly opposite the firehole, and the fire escapes through a flue at the top, just above the working door inside. After a certain time the salt gets to that point that it will be impossible to destroy the cyanides, so as to burn out the carbon completely, without fluxing the salt at the same time, because the carbon would be there as graphite, and it is quite impossible to burn it out at a temperature at which the carbonate of potash does not fuse. When it has arrived at that stage, the furnace man fills his furnace with a thick smoke. He then suddenly opens the working door, which is right opposite the fire, and thus burns the smoke throughout the furnace; and it appears as if by a kind of infection, perhaps by the local heat produced right through the salt itself, the cyanide is completely destroyed, and also the graphite burnt off. The product coming from this process is a most beautiful white carbonate of potash of great strength.—*Mechanics' Magazine.*

The August Meteors.

The meteoric shower of the 9th, 10th, and 11th of August last was observed at several points on the continent of Europe, and the following results were obtained: At Turin, Italy, during the first night 127 shooting stars were counted; a fine aurora also took place, lasting 13 hours. On the second night 334 meters were noted, accompanied by an auroral light lasting three hours from midnight. The third night being cloudy, but 54 stars were observed. At Marseilles, France, 164 meters were counted on the first night, and 170 on the second. The point from which all seemed to radiate was in the constellation *Cygnus*. A faint auroral light was remarked. At Geneva, nearly half of the stars composing the shower came from different directions. At Alexandria, Egypt, 1,167 meteors were noted on the second night, and at Barcelona, Spain, 886

M. EISENLOHR, of Heidelburg, has recently translated an ancient papyrus found in a tomb in Egypt, which he considers affords abundant proof of the verarity of the Scriptures regarding the foundation of the Mosaic dispensation. The text of the papyrus is an "allocution" of King Rameses III, concerning the important events of his reign; it recounts how a religious revolution was suppressed, which could be under no other leadership than that of Moses, and describes the series of events ending in the exodus of the Israelites. It has been known, though not on indisputable basis, for some time that Moses was contemporary with Rameses III, and it is believed that the reason his writings do not speak of the conquests of the monarch is that they took place during the wanderings in the desert.

CELERY AS A NERVINE.—A correspondent of the *Practical Farmer* says: "I have known many men, and women too, who, from various causes, had become so much affected with nervousness that when they stretched out their hands they shook like aspen leaves on windy days; and by a daily moderate use of the blanched foot stalks of the celery leaves as a salad, they became as strong and steady in limbs as other people. I have known others so very nervous that the least annoyance put them in a state of agitation, who were in almost constant perplexity and fear, and who were effectually cured by a daily moderate use of blanched celery as a salad at mealtimes. I have known others cured by using celery for palpitation of the heart.

IMPROVED SAFETY GUN LOCK.

There is no more common accident among sportsmen and others having frequent occasion to use firearms than the premature discharge of the piece caused by the catching of the hammer in a part of the dress, a projecting twig or other obstacle, and its consequent lifting and snapping down upon the cap. The casual slipping of the gun from the hand, so that the shock of the fall is brought on the hammer, even if the latter be not cocked, is another prolific source of unlooked for and often dangerous explosions.

The invention below described and illustrated by the accompanying figures is especially designed to obviate such accidents, while it provides a much simplified form of lock, and, besides, insures for the stock of the piece a much lighter and more symmetrical appearance.

Fig. 1 gives a side view of the gun, showing the stock and part of the barrel. Fig. 2 affords a clear idea of the working parts of the lock. Fig. 3 represents a perspective view of the hammer contained in the trigger guard, the shape of the former being shown by the breaking away of the upper portion of its inclosure. The principal improvement is seen in Fig. 1, and consists in an opening or recess, A, cut entirely through the gun stock and metal guard, G, in which the hammer, B, moves, and is thus protected from accidental blows, etc.

The lock is situated in the forward portion of the trigger guard C, and is represented in detail in Fig. 3. D is the trigger held by the spring, E, directly against and engaging in the notches on the tumbler attached to the hammer. The gun is not impaired by the opening, A, as the metal bands of the lock guard above and below the aperture render the stock of ample strength. The nipple is made in an L form, and is constructed and placed so as to suit the shape of the hammer.

Fig. 1

Fig. 2

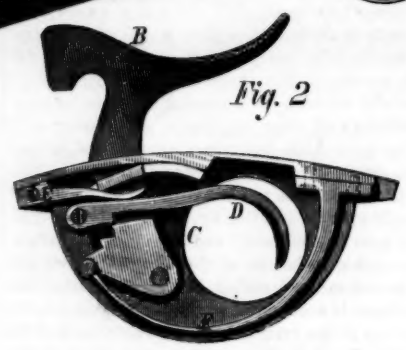


Fig. 3

BYERS' SAFETY GUN LOCK.

Patented through the Scientific American Patent Agency, Sept. 24, 1872. Further information may be obtained by addressing the inventor, John J. Byers, Delta, Oneida Co., N. Y.

RAFTER HOOK AND FIRE ESCAPE.

Recent ordinances passed in New York city and also, we believe, in nearly all of the larger cities in the United States, render it obligatory upon owners of hotels, tenement houses, and other buildings in which numbers of people reside, to provide adequate means for escaping from the upper stories, in case of fire. The usual appliance adopted to meet this requirement is a light balcony from which permanent iron ladders extend nearly to the ground. This mode, apart from its expense as a fixture, has the disadvantage of being available only at the point at which it is located, so that if access be cut off thereto, it is virtually useless. This difficulty is overcome in the invention illustrated herewith, which furnishes not only a cheap, but a light, portable and, it is claimed, efficient fire escape. Figs. 1 and 2 represent the hook by which the ladder used is attached to the building. This device is the subject of a separate patent and may be employed not only in the above connection, but also as a rafter hook, or, in fact, for any use in which the object is to furnish a secure support or fastening, and also to permit of instantaneous detachment of the same from the sill rafter or beam on which it hangs. Fig. 1 shows the hook attached. To it is pivoted, as shown, a slotted lever, A, which is turned up when the hook is applied to the support. In this position the lever butts against the stop, B. To detach the apparatus it is merely necessary to pull down on the cord connecting with the end of the lever. The latter is thus caused to roll with its rounded inner part on the support, gradually clearing the same of the hook, with which it finally forms a loop as in Fig. 2. Fig. 3 shows the ladder or fire escape properly folded in portable form, so as to be carried in the hand, and Fig. 4 a portion of the same extended and applied to a wall. The ladder is composed of U shaped sections made of wire or strap metal, and is so constructed that the side bars of one section embrace and are coiled around the upright side pieces of that next above. The dotted lines, C C, in Fig. 4, show the position of the bars of the section, D, when thus raised up. The same engraving also clearly represents the above described method of joining the sections together. It will be seen that, thus constructed, all the sections can slide upon each other, so as to be packed in small compass, as shown in Fig. 3. The rounds of the ladder may, if required, be enlarged by having plates or steps secured to them, the ends of each section being extended laterally from the braces, E E, which keep the ladder at a suitable distance from the wall. Fig. 5 shows the escape complete and in actual use, and also exhibits how it may be attached by the hook either directly to the sill or to the inside casing of the window.

Fig. 1.

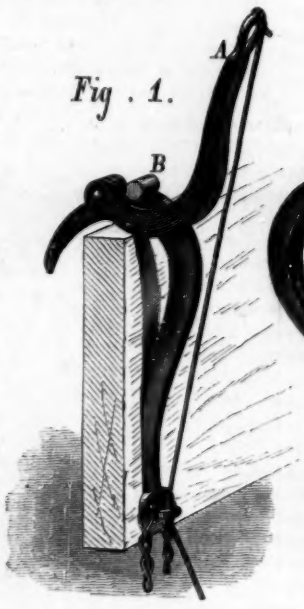
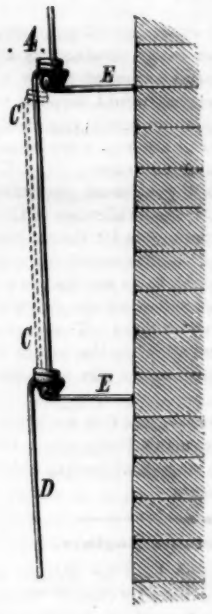


Fig. 2.

Fig. 3.

Fig. 4.



RAFTER HOOK AND FIRE ESCAPE.

Fig. 5.

Patented through the Scientific American Agency, March 12 and June 25, 1872. For further information address the inventor, Mr. C. G. Buttkereit, Toledo, Tama Co., Iowa.

Selenitic Mortar.

At the recent meeting of the British Association, a paper was read showing the importance of the discovery of General H. Y. D. Scott, whereby a species of limestone, hitherto considered almost useless, is rendered valuable in the manufacture of cements and mortars.

General Scott was the first to observe, about sixteen years ago, that a limestone, which does not possess to any useful extent, if at all, the characters essential to its conversion by burning into a hydraulic lime, may be made to furnish a good cement by simply allowing a small proportion of sulphurous acid gas (obtained by burning sulphur or other well known methods) to pass into the kiln during the burning of the lime. The latter, when subjected to this slight modification of the ordinary kiln treatment, (instead of slaking or combining rapidly with water, with considerable evolution of heat,) undergoes only gradual hydration, unattended by any important elevation of temperature, and sets or hardens after a time, behaving, in fact, in every way like a cement of good quality, and sometimes equaling Portland cement in strength. The production of the so-called Scott's cement, by this simple modification of the lime-burning process, has been carried on to some extent for a number of years, and a medal was awarded to Colonel Scott in 1863 for its invention; but some practical difficulties attended the production of uniform results, and these appear to have retarded any very considerable adoption of this method of manufacturing cement. It was found that in lime so treated a small proportion of calcium sulphate, seldom exceeding 5 per cent and frequently below that proportion, was formed; and that an admixture of a corresponding quantity of a soluble sulphate or of sulphuric acid with the lime yielded similar results, but the difficulty of securing uniformity in the influence exerted by the sulphate upon the lime when employed in this manner upon a scale of actual practice, precluded the attainment of successful practical results. By a most simple modification in the mode of applying them, General Scott has now brought the peculiar influence which sulphuric acid or a sulphate exerts, in preventing the heating and promoting the setting and hardening of lime, to bear with perfect success and uniformity upon lime of the ordinary kind used for mortar and plastering purposes. The sulphuric acid or sulphate (which may be called the selenitizing agent) is first mixed with the water to be used in making the plaster or mortar, in the proportion corresponding to about 5 per cent of calcium sulphate upon the lime used. The lime is then added, and these ingredients are triturated together until they form a creamy paste, after which the paste is mixed with the requisite proportion of sand for the production of the quality of mortar required.

The invention is applicable to a variety of uses, but chiefly to the production of mortar for ordinary building purposes, to plaster work, and to making concrete. It is also adapted to brickmaking, and the preparation of building blocks of any size and in an ornamental form. The Messrs. Bodmer have succeeded in producing with it bricks that are almost as hard as marble, and have faces of great beauty of texture and color. According to the proportion of sand employed in the mixture either a very smooth surface, or one resembling that of a granulous freestone but very much harder, can be obtained. The Scott's cement and the selenitic mortar have been tested in a variety of ways and by different persons, as to their powers of resisting crushing forces and tensile strains and in all cases the results have been highly tisfactory.

The superior adhesion of selenitic mortar to smooth surfaces was markedly shown in experiments made in comparison with Portland cement by bedding two flooring tiles crossways. After fourteen days being allowed for setting, the resistance of the Portland cement mixed with two parts sand to one of cement was 56 lbs., the cement in most cases completely leaving one of the tiles. On the other hand the selenitic mortar gaged with five parts of sand to one of lime, when similarly tested, always broke through the joint and resisted fracturing until weighted with 158 lbs. This is not the only application in which selenitic mortar shows a superiority to Portland cement.

Selenitic mortar in ordinary dry brickwork, with four or five parts of sand and upwards, will give greater strength than Portland cement used under similar conditions.

ORNAMENTATION OF CONCRETE WALLS.—A writer in the *Builder*, in the expectation that the use of cement or concrete is likely to become quite extensive for architectural purposes, suggests that ornamental encaustic tiles might be employed to advantage in facing concrete walls. He admits that these tiles are now partially used for the purpose, but demands their employment as the sole vehicle of exterior decoration, in a well studied artistic manner as to color and pattern, in harmony with the design and uses of the building. The idea is a good one, and we hope that architects will reflect upon it.

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Contents:

(Illustrated articles are marked with an asterisk.)

MORE LIGHT.

The duplex tendency of modern science, to multiply the number of observed phenomena and at the same time to simplify our interpretation of them by bringing, into consistent and comprehensible order, facts that have seemed to be capricious, irregular and isolated, is happily shown in the latest discoveries in regard to the nature of sun light.

Hitherto the sunbeam has been thought to have a threefold character. It illuminates, warms and induces chemical changes; hence the inference has been that it must be composed of three distinct sorts of rays, interwoven like the triple strands of a cord but disentangled when subjected to the refracting influence of a lens or a prism. The evidence for this view has been very convincing. That the maximum illuminating power of the solar beam lies in the yellow portion of the spectrum is patent to every observer. Sir William Herschel found, by careful thermometric study of the spectrum formed with a prism of glass, a very unequal distribution of heating rays: there are very few in the violet end, from which point they increase slowly through the blue, green and yellow, very rapidly in the red, and attain their maximum manifestation in the invisible portion of the spectrum below the red. Dr. Wollaston, experimenting with the sensitive salts of silver, developed a similar inequality in the distribution of the so-called chemical rays, their intensest influence appearing in the violet and ultra-violet portion of the spectrum. From these and a multitude of later observations, telling substantially the same story, the supposed threefold character of the solar emanations has come to be a generally accepted article of scientific belief. Now, however, it appears that, while the observations were correct, the inference drawn from them was a mistake. Nearly thirty years ago, Dr. Draper called attention to an inherent defect in the prismatic spectrum, a defect originating in the very cause which gives rise to the spectrum, namely, unequal refrangibility. The rays toward the violet end are much more widely separated than those of the red end, and consequently a smaller number fall upon any given surface—as for example the bulb of a thermometer—and produce proportionately a smaller thermic effect. The fact, therefore, that the temperature of the violet portion of the spectrum is lower than that of the red does not prove absolutely that a violet ray has a lower heating power than a red ray, though it would seem so at first sight; the observed inequality may, and as experiment shows, does, arise wholly from the nature of the prism.

By an elaborate series of experiments, Dr. Draper has just shown that, if the visible spectrum be divided into two equal portions and all the more refrangible rays be collected into one focal group, and all the less refrangible into another, the heat-producing powers of the two are practically equal, instead of being strikingly unequal as they would be if the current belief were correct. He chooses, as the optical center of the visible spectrum, the ray having a wave length of 5768—the mean between the wave lengths of the less and more refrangible ends—and proves the portions on either side to have heating powers "so nearly equal that we may impute the difference to errors of experimentation." This demolishes the opinion that there exists in the solar spectrum a heat spectrum covering the less refrangible regions. Does the belief in a chemical spectrum in the more refrangible regions also stand on untenable ground?

Dr. Draper promises to publish soon the result of his studies in regard to the actinic power of the sunbeam. From intimations already given, we may infer that he will demonstrate the chemical power of rays of every kind, whether of low or high refrangibility, and thus bring this property of the sunbeam, as he does its heating power, into perfect harmony with the modern doctrine of the conservation and transmutation of motion.

The same result, we may add, has been arrived at by the European observer, Professor Lommel, who remarks, in a recent paper, that the curve of so-called chemical intensity only indicates the relation of the sun rays to certain reagents. Different substances absorb different rays, and chemical action, like light and heat, arises solely from such absorption. The fact that the violet and ultra-violet rays act with special force on the salts of silver is no reason for distinguishing them as *the* chemical rays. Other substances are chemically affected by entirely different rays, as for instance the coloring matter of plant leaves, chlorophyll, which is acted on chiefly by red light.

It is worthy of notice that, while these important discoveries materially modify scientific opinion, the change is—like all scientific progress—toward a simpler expression of knowledge; the supposed existence of various principles in the solar emanation disappears to give place to a view in harmony with the widest generalization yet made by man, namely, that there is neither heat, light, nor chemical action in the sun ray, but simply motion, which develops any or all of these manifestations according to the nature of the absorbing substance.

THE FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The well filled pages of the French scientific journals indicate that the many industries of France are rapidly recovering from the disastrous effects of the late war. Not only is this apparent, but the popular belief is becoming strengthened: that, by the advancement and diffusion of scientific knowledge, by the cultivation of a scientific mode of thought and study, and by the union of those learned in theory with others equally skilled in practice, the regeneration of the country may be greatly promoted.

A body has lately been organized on the above principles, termed the "French Association for the Advancement of Science," the first meeting of which has recently been held in Bordeaux. The *séance* was in every way successful, not only numbering among those attendant the names of many distinguished Frenchmen, but also those of Messrs. Gladstone of England, Respighi of Italy, Soret of Switzerland, and others whose celebrity is world-wide. At its commencement, the society has 800 members, a capital of 150 000 francs and a revenue of 16,000 francs per annum. M Quatrefages was elected President, and M. Wurtz, Vice-President, for the ensuing meeting to be held at Lyons in 1873.

A NOVEL NEWS BULLETIN.

Madison Square in this city, at the intersection of Broadway, Fifth Avenue and Twenty-third Street, is one of our most central and notable places. Vehicles and pedestrians converge here from various directions, the square is splendidly illuminated by the new oxygen lights at night, and the locality presents at all times a scene of activity and life. The streets here form a narrow triangle, the sharp apex whereof, covered with a group of small buildings, points directly into the open square. Upon the extreme point of the angle, a diminutive hood or lighthouse has been placed, within which an oxyhydrogen or calcium light and a magic lantern are used to throw pictures, at night, upon a canvas screen, perhaps twenty-five feet high, which is hung from a frame arranged on the roof of the adjoining buildings. The canvas stands in full view from all parts of the neighboring square, and the apparatus is employed in the evening for the exhibition of illuminated advertisements of all sorts. The advertisements are photographed upon glass, and, on being introduced within the lantern, are brought out upon the screen in large characters and beautiful colors. Well executed photographic pictures are also thrown up by way of variety, and the exhibition attracts crowds of people.

On the evening of the recent elections, this magic lantern apparatus and screen was put to use as a news bulletin for the New York *Times* newspaper. As fast as the telegrams of the election returns were received at the telegraph office, which is just across the street, they were written off with India ink on transparent pieces of gelatin, placed in the lantern, and instantly shown upon the screen in huge characters, to the delight of the waiting multitude below. The whole square was thronged with people, who made the welkin ring with their shouts whenever the telegrams particularly pleased them. The lighthouse man would then introduce the figure of a huge negro, in scarlet coat, sitting on a stump and laughing as if his sides would split, or some other amusing thing, the appearance of which on the canvas would be greeted with roars of laughter. It is probable that ten or twenty thousand persons were present, all of whom enjoyed a fair view and easy reading of this truly novel, conspicuous, and admirable news bulletin.

PROFESSOR JOHN TYNDALL.

It is with especial pleasure that we announce the arrival in New York of this distinguished scientist, who visits our shores for lecturing purposes, observation, and recreation. His lectures will illustrate the latest researches upon Light, and will command marked attention. He is one of the most clear and interesting speakers, and possesses the happy faculty of making every part of the science which he takes in hand thoroughly understood by his hearers. It is stated that he will commence his series of lectures in Boston, returning to New York some time in December. He has been invited to meet the members of the Lyceum of Natural History, in this city, and other societies, before going to Massachusetts. On his arrival here he was welcomed at the wharf by Mr. Hector Tyndall, of Philadelphia, a near relative. In his personal appearance, according to the daily papers, Professor Tyndall is small in stature, of spare face, has bright gray eyes, and a short iron gray beard, wears spectacles, and dresses in black.

AMERICAN STERLING—A NEW AND REMARKABLE ALLOY.

A company has been recently formed here for the introduction of a new alloy, termed "American sterling." The composition is as yet unpatented and its proportions are consequently secret, but results, drawn from a series of careful tests and experiments, point plainly to the fact that the new metal is not only a discovery of great importance, but to all appearances calculated to revolutionize a large and flourishing branch of industry.

In its crude state, this new alloy resembles nickel; but after being worked up, it is almost undistinguishable from silver. Unlike the latter metal, it does not tarnish and is unaffected by sulphurous vapors, so that it is eminently adapted to replace silver, Britannia or the ordinary alloys in the manufacture of table ware. Articles of food have no action upon it; alkalies produce a temporary tarnishing which may be immediately removed by a slight rubbing with the hand. Made in the form of cutlery, the alloy possesses none of the disadvantages of steel or plate; it takes a keen cutting edge, requires little or no cleaning, and is unaffected by ordinary organic acids. Knives made from it show no black edges after short usage as is the case with plate, while they can be ground or sharpened whenever necessary. The metal is unusually flexible and tenacious; a table fork made from it was, in our presence, twisted into a perfect knot, without showing the least flaw or intimation of breakage.

In the manufacture of hollow ware, there is little doubt but that, when this composition becomes widely known, it will prove a formidable rival to, if it does not entirely supplant, German silver and its kindred alloys. It is not only harder but one third lighter than Britannia metal, while its cost is about one half that of plated ware. Although the articles made from the solid sterling present an appearance equal to fine silver, the alloy may, when required, be used as a basis for electro-plating, the smoothness and evenness of its surface rendering it possible to give the deposited silver a much higher finish than can be imparted to ordinary plate. As the silver wears away in course of time, the sterling, being of the same color, gives no evidence of the fact, so that the unsightly brassy edges and backs common to long used plated table ware are entirely obviated.

The effect of hammering or compression on this composition is to give it an increased elasticity. Its strength is so great that it can be, and has been, substituted for steel in the manufacture of pistol barrels, while repeated tests, made at the Colt Armory, at Hartford, Conn., show that it has three times the tenacity of the latter metal. At an experimental trial, a spring of steel wire parted at 3,000 pulls; 83,000 pulls were necessary to break a precisely similar wire of sterling.

The American Sterling Company, Leavitt Hunt, Esq., President, by whom this metal is manufactured, has its offices at Nos. 1 and 3 Dey street, in this city. Among its directors are many gentlemen well known as of long experience in the silverware trade. The works are located at Naubuc, near Hartford, Conn., and consist of substantially built brick buildings, 500 feet long and 50 feet wide. About 120 hands are employed, and some $100,000 worth of tools of every description are in use. A late visit to this interesting factory enabled us to witness the manufacture of the composition and its subsequent transmutation into finished table ware. Five melting furnaces are used, and about 2,000 pounds of alloy are daily finished. The crucibles used contain 150 pounds each of the metal, which, after melting, is run into ingots about two feet and a half in length. In this condition it is largely sold to spoon and fork manufacturers, throughout the country, at the price of one dollar per pound. The annealing of the ingots is accomplished in a furnace of novel pattern. The bars are placed on a low, wide chamber, below which is a large wood fire. The grate is surmounted by a fire brick arch. The upper chamber has a flat floor, and is also arched above. The heat passes through openings at the side of the fire space, up outside of the same, and then enters the annealing chamber through apertures in its side. In this furnace, which is some twelve feet in length, an entire days' melting can be annealed in two hours.

The rolling mills and subsequent processes for reducing the metal to the requisite degree of tenuity are of the ordinary well known descriptions. At the time of our visit, the factory was engaged upon the manufacture of spoons and forks exclusively, although abundant machinery was at hand for the manufacture of the most elaborate table services. Several specimens of the latter, experimental pieces in the shape of elegantly made and designed ice pitchers, salvers, etc., were shown to us, from which we were able to obtain an excellent idea of the perfect adaptability of the material to the purpose.

With the process of manufacturing spoons and forks by means of suitable dies in drop presses, our readers are doubtless familiar. We have therefore only to add that the alloy is worked by this means as readily as pure silver, and much more easily than the ordinary German or nickel silver. But here an important advantage must be noted. In using the last mentioned material, at least three gross, out of every ten, of forks or spoons are spoiled—that is, owing to the brittleness of the metal, they become cracked under the powerful

blow of the drop, and are consequently thrown into the scrap heap. With sterling, none are wasted, for the extreme tenacity of the alloy allows it to be bent into any shape, however intricate, without the slightest deterioration. Polishing is effected by grinding, burnishing and afterwards buffing, leaving the work perfectly brilliant and lustrous. From sixty to eighty gross of spoons and forks are made at the above mentioned works weekly, meeting, as we understand, with a ready market.

For articles subject to the oxidizing influence of the atmosphere, such as harness trimming, reflectors for locomotive lamps, badges, etc., this metal is especially appropriate. In fact, the number of uses to which it may be put in the future seems unlimited, for it appears equally adapted to be made into twenty inch cannon or ladies' jewelry. It can be cast in molds, or wrought, while its remarkable strength, combined with its flexibility, renders its durability unquestionable.

THE WHISTLING LANTERN---WHO IS THE REAL INVENTOR?

In the SCIENTIFIC AMERICAN of May 25th 1872, we published an interesting account of a "New Sensitive Singing Flame," being a communication from Professor W. E. Geyer, of the Stevens Institute of Technology, to the *American Journal of Science*. In that communication, Professor Geyer describes his experiment as an improvement upon the well known singing flame of Philip Barry, which latter is produced by placing a piece of ordinary wire gauze on the ring of a retort stand, about four inches above the burner, and lighting the gas above the gauze. At the least noise, this flame roars and sinks down, and acts in a very curious manner. Professor Geyer stated that his improvement consisted in simply covering Barry's flame with a moderately large tube, resting loosely on the gauze. "A luminous flame," he says, "six to eight inches long is thus obtained, which is very sensitive, especially to high and sharp sounds. If now the gauze and tube be raised, the flame gradually shortens and appears less luminous, until at last it becomes violently agitated, and sings with a loud uniform tone, which may be maintained for any length of time. Under these conditions, external sounds have no effect upon it. The sensitive musical flame is produced by lowering the gauze until the singing just ceases. It is in this position that the flame is most remarkable. At the slightest sharp sound, it instantly sings, continuing to do so as long as the disturbing cause exists, but stopping at once with it. So quick are the responses that, by rapping the time of a tune, or whistling or playing it, provided the tones are high enough, the flame faithfully sounds at every note. By slightly raising or lowering the jet, the flame can be made less or more sensitive, so that a hiss in any part of the room, the rattling of keys, even in the pocket, turning on the water at the hydrant, folding up a piece of paper, or even moving the hand over the table, will excite the sound. On pronouncing the word 'sensitive,' it sings twice; and in general, it will interrupt the speaker at almost every 's' or other hissing sound."

So much for the discovery of Professor Geyer, which is certainly very interesting.

On September 10th, 1872, under the title of "The Whistling Lantern, a new Safety Lamp for Miners," we gave the substance of a paper, read in August last, by Dr. A. K. Irvine, of Glasgow, Scotland, before the Iron and Steel Institute, in which, before reaching the description of the constitution of his lantern, he describes the general principle on which it operates. He stated that, "when a mixture of any inflammable gas or vapor with air in explosive proportions passes through and is ignited upon the surface of a disk of wire gauze of such mesh as to prevent the passage of flame, and a suitable tube or chimney is placed above and surrounds, at its lower end, the disk, preventing the admission to the chimney except through the wire gauze, a musical sound is produced, varying in pitch, etc., with the size of flame and dimensions of the chimney. In this, as in other flames singing in tubes, the sound is caused by the vibration of the flame, determined or intensified by the current up the chimney, and communicated to the column of air or gaseous fluid within the chimney, whose length commands and times the rapidity of the vibrations so as to produce a given note, just as the flutter of the air originating at the *embouchure* of an organ pipe is commanded by the length of the pipe."

It will be observed that the formation and operation of this flame is substantially the same as in the experiment of Professor Geyer.

After some further observations upon other sensitive flames, Dr. Irvine goes on to describe some of the *practical uses* to which he had applied the improved flame. He had made lamps, he said, "for giving light, which, while the atmosphere is not contaminated by fire damp or other inflammable gas, burn in the usual way, but which, as soon as such a gas mixed with air in explosive proportions enters it, appeals to the ear by a loud musical sound, as well as to the eye by its effects on the appearance of the flame in the lamp—just as in the Davy. In one form of the lamp, which is more particularly adapted for the use of the viewer, the air is made to enter near the top of the lamp, obviating the necessity of turning the lamp on its side, as is frequently necessary with the Davy when but a thin layer of the fire damp is floating at the ceiling of the mine. In another form, the lamp is adapted to the use of the working miner, and a superior light is obtained by the use of paraffin oil. In a third form, specially constructed with the object of being a warning apparatus as well as a stationary light, the sound is given forth when an atmosphere of gas and air under the explosive point enters it. Another application of this singing flame was its use as a *fog horn*, which, on account of its portability, simplicity, and cheapness, might take the place of a costly apparatus, and would be highly suitable for railway junctions or other situations of danger. *All the above apparatus were made to sound during the reading of the paper*, and elicited much applause."

The *Gas Light Journal* states that this discovery will, in consequence of the wide circulation of the SCIENTIFIC AMERICAN, be sown broadcast over the civilized world; and our contemporary is fearful that Dr. Irvine will receive the exclusive credit, which, it thinks, would be an injustice on our part towards Professor Geyer: which is very strange reasoning. But the fears of our contemporary, we think, are groundless.

The position of the SCIENTIFIC AMERICAN in respect to the new discovery is, simply, that it has published the accounts of the new flame, as given by the authors themselves, from which it appears that the priority in date of Professor Geyer's publication is a matter of record.

In regard to the application of the discovery to practical purposes, the credit thereof appears to belong alone to Dr. Irvine, who has adapted it to the use of miners, in the form of a paraffin oil lantern, and has brought it out in several other practical forms, such as fog horns, ship signals, railway junction alarms, etc. In Professor Geyer's paper, no allusion is made to the practical uses of the flame, nor does it appear from that document that he had ever tried to produce it except within loose tubes, for experimental purposes.

SOUP AND SAVANTS.

The old and familiar proverb "Too many cooks spoil the broth" will have to be amended by substituting for the word "cooks" the word "doctors;" at least, so it would seem from the accounts which come to us through some of our transatlantic exchanges. All our readers of course know of Liebig's world-renowned process of procuring the extract of meat. This extract has become an article of great and constantly growing importance. By means of this process, it has been made possible to bring (to countries where, owing to dense population and other causes, meats are scarce and dear) a large portion of the most nutritious qualities, in a concentrated form, of the meat of cattle slaughtered in countries where there is such abundance of it that has not heretofore been worth saving, the cattle being destroyed for their hides and tallow alone. An engineer named Gilbert, under the advice and counsel of Liebig, prepared this extract in South America, whence it was imported to Munich, where it was not allowed to go in the market until subjected to the scrutiny of the eminent chemist who was the inventor of it. Under this careful management, it acquired a great celebrity, was much recommended by the highest authorities, and it was liked and believed in by the people who used it. The soup or broth prepared from this extract was found to be not only harmless, but nutritious and palatable both for the sick and the well.

But among other enterprising savants, one Dr. Müller, perhaps actuated by motives such as occasionally influence some of our savants on this side of the water, has been drawing certain inferences from certain experiments which he has been making, which, if he is to be believed, ought to lead every person who has a due regard for his inner man to utterly discard broth, now, henceforth, and for ever. It has no nutritive qualities, says he. It is only an excitant, and its exciting qualities are due to certain salts of potash to be found in it. One of the experiments given, performed by M. Kemmerich, seems to be conclusive that horse beef broth in large quantities is not good for rabbits. The extract from a pound of horse beef, injected into a rabbit's stomach, killed the creature.

But without going into these experiments, or commenting further upon the subject, we hold, as an "opinion as is an opinion," that the people will continue to eat broth, no matter how many doctors try to spoil it.

LEATHER BELTING---FACTS FOR THE DETERMINATION OF THE QUALITY OF THE LEATHER.

Mr. W. Eitner, a technical chemist at Prague, Bohemia, has communicated to the German press a very elaborate investigation of the above subject, interesting to every mechanic and engineer, of which we translate the following summary:

The author commences by saying that the value of a belt depends mostly upon the quality of the material, and not upon the manner of its manufacture; but it is by no means easy to judge of the quality of the leather, owing to the fact that its appearance varies according to the manner of its preparation. Moreover, although certain kinds may be a criterion by which we can form an opinion on others, all kinds cannot be judged of in this way, as inferior leather may be made to look like leather of good quality. The quality, therefore, cannot be determined by the outward appearance, because a good looking surface is easily made to hide a defective tanning, which can always be recognized by making a vertical cut with a sharp knife.

Belt leather may be divided into two classes, according to the manner of its manufacture: 1. Leather tanned with concentrated tan bark extracts. 2. Leather which, after having been superficially treated with such extracts, has been finally tanned in the old manner (in tan pits). The first method, termed sweet tanning, may be called tanning in the quick way, as it is completed in from three to four months; while the second method, termed sour tanning, requires eight, twelve or sixteen months, according to the thickness of the hide. These figures refer only to belt leather; other kinds of leather require different periods of time. The sweet tanned leather appears on the cut surface as a homogeneous mass, presenting no variety of parts or structure. When viewed with a magnifying glass, it may be seen that it is formed of exceedingly fine fibers similar to the cut edge of felt. Cutting the surface of sour tanned leather, however, reveals two different characteristics. Between the fibers, which are of a bright color, there is a dark, somewhat brilliant ground mass, which appears granular; the larger and darker this part is, the better the leather. This texture is the sign of excellent leather, which is solid, compact and elastic, and also possesses a certain degree of pliancy and flexibility, which are required in belt leather. If, from such leather, a round piece be cut out, well hammered and placed again upon the hole, it should, if it does not exactly fit into it, not have become perceptibly larger; this is a sign of its compactness and elasticity, which are only found in very well tanned products. Leather of this kind can be readily cut, requiring not more force than is necessary for cutting bread two days old; the direction in which it was cut should not be recognizable. When perfectly tanned by the sour process, or when tanned solely with extracts, there are always fine fibers, which lay in the direction of the cut (similarly to the fibers of cloth); these give on cutting a surface bright and brilliant in appearance; on the other side, the leather appears darker and dull, and permits us better to recognize the texture. This appearance is due to the prevalence of the fiber and the less quantity of the granular matter, which imparts to the leather greater solidity, density and resistance to exterior influences.

If it is generally advantageous to employ sour tanned leather for belts, it is especially so for belts for heavy machinery, or for belts to be used in damp places. They possess the very desirable property of non-expansion; they need not to be stretched, they do not tear, and they are very durable. We are far from asserting that bands made from sweet tanned leather are good for nothing; on the contrary, they are advantageously used for light straps, and they can be made of double thickness if used in place of a single sour tanned belt. Besides these two principal kinds of leather for belts, there are several medium kinds, produced by combining the two methods, etc. Leather tanned with extracts can be made to somewhat resemble sour tanned, and leather tanned with bark can be made to resemble the sweet tanned product. However, no kind of leather can be termed good if not thoroughly tanned, and its value is determined by the completeness of this operation. For this reason, its easy recognition is of great importance. Mr. Eitner describes a means by which it may be readily and with certainty ascertained whether a certain kind of leather has been properly tanned or not. The method is based upon the fact that the glutinous tissue is swelled by acids, whereby the fiber increases considerably in volume, being converted into a glutinous and transparent mass. This change does not take place if the tissue is completely impregnated with the tanning material; but, if the glutinous substance is only superficially coated with tannin (whereby, however, the leather attains the appearance of being well tanned), the said substance would invariably be converted by the acid into thick, transparent and glutinous fiber; and this change will take place with more or less rapidity according as the material has been less or more tanned. If a strip of properly tanned leather half an inch thick is placed in a glass test tube containing strong acetic acid, no change will be visible upon its cut surface, except that it will grow somewhat darker, as every substance does when wet; but the texture will remain unaltered. It is quite different with an imperfectly tanned product, in which the slightest defects manifest themselves in such a manner as to be recognizable at once, especially as the surface is magnified by the round shape of the test tube, In acetic acid, the imperfectly tanned parts grow first darker the glutinous tissue swells and is altered in the manner described; at the two edges, too dark, non-transparent stripes may be recognized. These are properly tanned leather. If the tanning is partial, some swelling takes place, if not momentarily, in the course of twenty-four hours.

As a material for tanning hides, young oak bark is best. Leather tanned with such bark is distinguished by a light brown color, and a dark brown surface where cut. Leather prepared with pine bark always exhibits on being cut a light reddish brown color, and is rarely perfectly tanned, owing to the fact that pine bark contains less tannin than oak bark. By using oak bark, six, twelve, or eighteen months are required to thoroughly tan a hide, and twice the time is required in using pine bark; and as hides are never left in the pit for so long a time, leather tanned with pine bark is always more or less imperfect. Leather tanned with valonia is easily recognizable by its dull, grayish brown, sometimes olive brown, color. Such leather is always brittle at first, and becomes more so in time. Leather prepared with extracts, of which hemlock extract (from the *pinus canadensis*) is mostly used, shows always a dark color, with a tinge of red.

Germany and Belgium produce the best belts. Belgian bands even surpass German bands, as, in the dressing, French elegance is combined with the thoroughness of German tanning. French factories produce also very good belts; but, although they are always well dressed, they are not always thoroughly tanned. Austria furnishes a medium product. English belts are highly esteemed and are vastly superior to American goods, which must be classed with medium German leather. America exports large quantities of leather to Europe, where it is manufactured into belts, which are mostly sold as English goods. In tests undertaken for the purpose of ascertaining the tensile strength of different belts, made in the presence of Mr. Eitner, it was found that those from Belgium and Germany ranked first; English belts of the most renowned establishments were greatly inferior, but still better than American belts.

A MECHANICAL EYE.

No mechanic can ever attain distinction unless he is able to detect ordinary imperfections at sight, so that he can see if things are out of plumb, out of level, out of square, and out of proper shape; and unless he can also detect disproportioned or ill shaped patterns. This is a great mechanical attainment. I say attainment, because it can be attained by any ordinary person. Of course there are defective eyes as there are other defective organs; the speech, for instance, is sometimes defective, but the eye is susceptible of the same training as any other organ. The muscles, the voice, the sense of hearing, all require training. Consider how the artist must train the organ of sight in order to detect the slightest imperfection in shade, color, proportion, shape, expression, etc. Not one blacksmith in five ever attains the art of hammering square; yet it is very essential in his occupation. It is simply because he allows himself to get into a careless habit; a little training and care is all that is necessary for success.

The fact is that the eye is not half as much at fault as the heedless mind. Some carpenters acquire the careless habit of using a try square every time they plane off a shaving, in place of giving their minds right to their business and properly training their eyes; and unless they cultivate this power of the eye, they will always be at journey work. Look at the well trained blacksmith; he goes across the shop, picks up the horse's foot, takes a squint, returns to his anvil, forges the shoe, and it exactly fits the foot. Contrast him with the bungler who looks at the foot, then forges a shoe, then fits the foot to it, often to the ruin of a fine horse. Now the fault lies in ever allowing himself to put a shoe on that is not in proper shape for the foot; he should determine to make the shoe fit the foot in place of the foot fitting the shoe, and he should follow it up until the object is accomplished.

A very good way to discipline the mechanical eye is to first measure an inch with the eye, then prove it with the rule, then measure a half inch, then an eighth, and so on, and you will be soon able to discover at a glance the difference between a twelfth and a sixteenth of an inch; then go to 3 inches, 6, 12, and so on. Some call this guessing; there is no guess work about it; it is measuring with the eye and mind. Acquire the habit of criticising for imperfections every piece of work that you see, do everything as nearly as you can without measuring (or spoiling it), or as nearly as you can trust the eye with its present training. If you cannot see things mechanically, do not blame the eye for it; it is no more to blame than the mouth is because we cannot read, or the fingers because we cannot write. A person may write a very good hand with the eyes closed, the mind, of course directing the fingers. The eye is necessary, however, to detect imperfections.

Every occupation in life requires a mechanically trained eye, and we should realize, more than we do, the great importance of properly training that organ. J. E. E.

Trade Marks.

Every person, or firm, doing business, no matter of what kind or nature, so long as it is honorable, should have a trade mark. It serves as an advertisement, and the first mere nominal cost is a trifle, and yet in a year's business the same amount of advertising would cost hundreds of dollars. The trade mark is a distinction that cannot be imitated, as the law protects it. Americans who excel in the manufacture of certain classes of goods, and place their goods in European markets, soon discover that they are not only in competition with the best makers of the same line of goods, but find that their trade mark protects them from imitation and counterfeit. Ingenuity can be called into exercise by the use of trade marks. Some use an almost indescribable monogram; others are eccentric or unique ones, but the most appropriate is the concentration of aptitude in the especial business in which parties are engaged. If a pyrotechnist, he would not use for a trade mark a fire engine engaged in putting out the flames of a building. There should be an eternal fitness of things. There are many people engaged in the same business, yet it would not be at all difficult to have an especial originality in their designs. Let manufacturers put a trade mark upon all their productions, and let dealers do the same to all the wares they send out. It is a protection to the former, and of vast business benefit to the other.

[The above from Gear's *Mechanical Advocate* is good advice. Manufacturers in this country, as a class, do not sufficiently appreciate the advantage of adopting some emblem appropriate to their business and securing it to themselves by registering it as a trade mark. The expense is small, compared with the advantages of such protection. In England, many manufacturers are very particular to register their trade marks, and a great number of them whose goods are sold in the United States register them here also. Parties at home or abroad can receive full instructions as to securing trade marks by addressing the publishers of this paper.—EDS.]

Design Patents to Foreigners.

Strenuous effort was made at the last session of Congress by some of our largest carpet manufacturers to get the law repealed which allows foreigners to take patents on designs in this country. Since the law was enacted permitting foreigners to secure their designs by letters patent, carpet manufacturers in England have availed themselves of the privilege to a great extent, and they have paid considerable money into the Patent Office for fees. In several weeks, hundreds of dollars have passed into the Treasury through this office alone.

Manufacturers here, who have so long found it less expensive and more convenient to adopt the new designs of foreign manufacturers than to employ native designers, are greatly disturbed because they can no longer practice the course formerly pursued by them. We hope Congress will refuse to repeal the law, but strenuous effort will be again made to accomplish it. Foreign manufacturers will do well to consider the probabilities, and such as would make sure of protection will lose no time in seeking it.

A pamphlet containing the law and full particulars as to patenting designs may be had at the office of this paper.

THE FAIR OF THE AMERICAN INSTITUTE.

The Fair is now in the full tide of success. Not only during the evening but throughout the entire day, throngs of visitors fill the building. Articles are still slowly coming in, but the general prediction of an increase in the number of entries over that of last year is, in our opinion, not likely to be fulfilled. The fact, however, can be explained, first, by the excitement attending the elections, which has diverted popular attention to other channels, and, second, by the unusually large fairs of Cincinnati and Louisville, to which many objects have been contributed which otherwise would have found their way to New York. Still the exhibition is highly creditable, and it is certain that there is no place of amusement in the city where an evening, a day, or even a week, may be more pleasantly and profitably spent.

The latest novelty that has been added to the machinery department since our last visit is an excellently designed and compact 8 horse power steam engine, from the Vulcan Manufacturing Company, of Fishkill, N. Y. The cylinder is vertical, and piston valves are employed. The principal point of advantage in the invention is an ingenious automatic arrangement whereby the governor, in event of the belt breaking, is caused by the action of a spiral spring to turn back in such a manner as to close the valve and so instantly to stop the engine.

For the present, and until other new inventions are added, we now leave the department of machinery, to which our notes heretofore have been exclusively devoted, and proceed to extend our rambles through other portions of the exhibition. A word of acknowledgment of our indebtedness for much kindness and courtesy is due to Mr. R. H. Buel, the superintendent of machinery. This gentleman, in his administration of the affairs of his department, is performing a disagreeable task in a most agreeable manner, and is winning well earned praises even from that unhappy class of exhibitors who invariably send their goods to the Fair and as invariably find cause to become indignant over imaginary ill treatment—after the exhibition has concluded.

THE DEPARTMENT OF THE DWELLING

is, to the general visitor, perhaps the most interesting portion of the display. Each year brings a host of new inventions, most of which are calculated to lessen the drudgery of household labor and render "women's work" easier to perform. One of the first articles that attracts our attention is a steam coffee roaster. A tin boiler, of about a foot in length and two or three inches in width, supplies steam to a toy oscillating engine, which turns a wire gauze cylinder in which the berries are placed. It is only necessary to set the machine in motion and leave it to itself until the coffee is roasted. The idea is an ingenious one, and probably an initiatory step to the introduction of steam power for the accomplishment of ordinary household duties; but then it seems to us that the apparatus in question is a shade beyond the intellectual capacity of the general type of Milesian handmaid. Near by is another article for culinary use which is an application of an old principle, and which should have been introduced long ago. It is termed

WARREN'S COOKER,

and consists essentially of two pots placed one within the other, the space between being filled with water. The substance to be cooked is placed in the inner pot and covered tightly, while the water in the outer vessel is caused to boil, when the apparatus is removed from the fire or set back on the range. The vessel containing the water, being hermetically closed, retains the warmth, so that the cooking process continues even after the source of heat is removed. It is stated that articles thus prepared lose none of their natural juices, and are better and more economically cooked than by any other method. For laborers, factory hands and others who generally have to carry their dinner to their work with them, eating that meal cold, the apparatus, we think, may be modified so as to be of considerable value. A small size of interior kettle will hold the meat, vegetables, etc., required for the meal, and the water in the outer vessel may be heated before leaving for work in the morning. Then the entire arrangement may be placed in a wooden box of convenient shape lined with boiler covering or other non-conductor of heat and tightly closed. No more attention is necessary until noon, when, on opening the pot, the dinner will be found excellently cooked and smoking hot. In

WASHING MACHINES,

we note none of especial novelty at present. The porcelain wash tubs exhibited last year are again presented, but we think that the similar conveniences of slate from the Penrhyn Slate Company are in every respect as well adapted for the purpose, while they are far less expensive.

NELSON'S GLASS DECORATIONS,

designed for application to walls, ceilings, etc., are worthy of a word of commendation. Ordinary sheet glass is painted in imitation of marble, wood, or in variegated patterns, and then firmly cemented to the plastering. The effect is very rich, the high polish of the material giving the appearance of elaborate finish.

DURAND'S SILVERED MIRRORS

are remarkably handsome and well worth examination. We notice one large specimen in particular, composed of a single plate of heavy glass surrounded by an exquisite border of filigree work in silver and gilding.

Slate mantels, from the various firms engaged in the manufacture, are displayed in every style. These have been so largely introduced into modern dwellings that we need make no special comment regarding them. The

MATTRESSES

are almost all variations on the well known and excellent network of wire, the points of difference lying in the arrangement of springs, etc. There is one novelty among these: a system of making both pillows and mattresses of bent springs distended by spiral coils of heavy wire. As usual, the inevitable bed to be presented to the President of the United States is on hand. As a matter of curiosity, we should like to be informed when that donation is to take place, as to our certain knowledge the same, or a very similar couch, has been on exhibition under the placard for two previous Fairs.

Messrs. J. and R. Lamb, although they have almost a monopoly in the manufacture of church decorations and furniture, exhibit such excellent work that we cannot refrain from giving it a word of praise. Similar credit is due to Messrs. Mitchell, Vance & Co. for a display of superb designs in gas fixtures, bronzes, and chandeliers. There is an ingenious little invention, attracting considerable attention in this portion of the building, known as Batcheider's

ELECTRIC TORCH,

which consists of two disks of hard rubber and leather which, when rubbed together, generate sufficient electricity to give a spark in the interior of a bell-shaped end of a long bent arm. In shape, the device resembles an ordinary spirit lamp gas lighter, the curve in the arm permitting it to be used while the globe on the fixture is in place. Another similar apparatus is exhibited, made with disks as above, which are attached directly to the burner, instead of being portable.

Passing out of the department of the dwelling and on to the main floor of the hall, we stop before a case of articles made by a process that is rapidly superseding the more expensive, though perhaps more artistic, method of carving in wood by hand. The work is made of

COMPRESSED WOOD.

Ordinary carpenter's shavings are pasted together at the edges in sheets, which are again attached together in layers of fourteen thicknesses. The board thus made is placed between brass dies and subjected to the action of a powerful hydraulic press which forces the wood into the matrices, molding it into the required form. The piece is then removed in the shape of a thin veneer, and is backed by ordinary material cut to the proper size. As the shavings of any kind of wood may be employed, it is evident that the most valued and elaborate carvings may be imitated.

On the right hand side of the hall are a number of tables and shelves covered with a remarkably fine display of the

PRODUCTS OF THE LAND DEPARTMENT OF THE NORTHERN PACIFIC RAILROAD,

including fruits, cereals, vegetables, and minerals. The vegetables are exceptionally large and fine, while the fruits and cereals give abundant proof of the wonderful fertility of the soil. The idea of thus bringing home to the people of the Eastern States the immense resources of our undeveloped Western territories, is worthy of special commendation, while such a method serves to describe a particular section of the country better than any number of brilliantly written and illustrated pamphlets or circulars.

In concluding our notes for this week, we must express our regret that it has been considered proper to admit peddlers to the Exhibition. We would suggest to the management that the "Professor," who executes sundry worn-out tricks of legerdemain to gather a crowd in order to sell political caricatures, and the individual who at stated intervals smears his raiment with a tallow candle for the purpose of removing the grease thereof with a "magic" compound, are not representatives of the industries of the American people. We also have to protest against exhibitors being permitted to cry their wares after the fashion of Chatham street vendors of second-hand garments. It is not agreeable to a nervous visitor to be suddenly startled by a yell in his ears like a Comanche war-whoop, or to be further annoyed by bottles of patent cement or vermin exterminator thrust before his eyes. These things may be pecuniarily lucrative to the Fair, but they decidedly detract from its merits and belittle the dignity which it should, at least, strive to maintain.

There is another subject to which we intended to revert some time since, but which has hitherto escaped our memory. We allude to the exceedingly questionable taste that allows of the exhibition of such objects as burial caskets and other receptacles of the dead. To a great many persons the sight of an infant's coffin, particularly such as are here exhibited, decked with satin and lace and opened as if to receive the body, is especially painful and distressing. If such articles must be displayed, let it be by small models, which will serve every purpose and not alloy the pleasure of visitors by forcing into prominence the somber paraphernalia of the grave.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

CLEANING BRASS.—C. G. S., and others.—See pp. 281, 298, 314 and 329, of our twenty-fifth volume.

HYDROGEN IN THE ATMOSPHERE.—F. F. suggests that the ignition, by electricity, of hydrogen in the air may be the cause of many loud thunder claps, and that the combustion may cause the additional rain which often falls after the lightning flash. Answer: The theory is not new, and has been published in many of the ordinary text books.—J. T. N., of N. Y.

DISTANCE OF THE EARTH FROM THE SUN.—Will any one of the wise people who know (?) that the earth is nearer to the sun at one season of the year than at another be kind enough to tell how they know it?—D. Answer: A very little attention to the subject will convince D. that the distance of a heavenly body can be easily ascertained, and will save him from questioning the accuracy of those who are better informed than he is. Norton gives the following method of ascertaining the distance of the sun, simple enough to those who have access to the necessary instruments and books: Measure the altitudes of the upper and lower limbs, and take half their sum for the altitude of the center, and add or subtract the apparent semi-diameter of the body, taken from the *Nautical Almanac*. The observations are facilitated by using the movable micrometer wire in establishing the contact with the limb; then by turning the micrometer screw, measuring the interval between the position of the movable and that of the parallel stationary wire, and adding the measured interval to the mean of the microscope readings.—J. T. N., of N. Y.

OXYGEN AND HYDROGEN.—A. W. asks: Is it dangerous to combine hydrogen with oxygen, having the gases in separate cylinders, and a rubber tubing from the cylinders to a platinum burner? Answer; The combustion of hydrogen with oxygen can be done with safety, and is daily effected by the oxyhydrogen gas light; accidents have, however, taken place from careless handling. A mixture of the gases in a vessel in certain combinations will explode if ignited. One part of hydrogen and eight of oxygen by weight, or, in other words, two volumes of hydrogen to one of oxygen, will explode on contact with an electric spark or any red hot substance. The vessel will be seen, afterwards, to be bedewed with water, which is thus, in the language of the chemists, H_2O.—J. T. N., of N. Y.

PERISHABILITY OF AIR AND WATER.—F. F. of Me., asks: Why is it that water, air, and other universal substances do not wear out? Answer: Nothing ever "wears out." It merely changes its form, appearance, and locality. A textile fabric has its surface abraded, but the cotton, wool, or silk is merely rubbed away; and even if burnt by fire, the elements of which the fibers are constituted still exist in undiminished quantity, ready to unite again to form the same substance. "Wearing out" is an absurd phrase when used in reference to Nature or Science. The quantity of matter in the universe is without doubt the same as it always was; and different substances change their characteristics only. And these changes affect water and air as well as all other matter.—J. T. N., of N. Y.

SAW MILL QUERIES.—M. M. S., of Ill., asks: What is the proper speed for a portable engine, used to drive a circular saw, the cylinder being ten inches in diameter with a sixteen inch stroke? Also what is the power of an engine (it being new and first class) with steam at eighty pounds? What is the rule for measuring the power of engines? Answer: You do not tell us the size of your saw. If you run the engine so that the periphery of the saw travels at the rate of 9,000 feet per minute, you will have a good average speed for ordinary work. To ascertain the power of an engine, you must have the number of revolutions per minute, in addition to the other figures. Your engine, if well built, should give you half a horse power for each revolution per minute. To find the horse power of an engine, multiply the pressure per square inch in pounds by the piston speed in feet per minute, and then multiply the result by the area of the piston in inches, and divide by 33,000. Your piston measures 78·5 square inches; so 80 lbs. pressure x2·66 feet (the travel of your piston to each revolution) x78·5=16701·8, foot pounds, 33,000 of which are a horse power.—J. T. N., of N. Y.

POWER OF LEVERS.—G. D. asks: How much power can be obtained by a lever or series of levers 5 or 6 feet in length? Is there any rule that can be used to calculate the power that may be exerted in that way? I would make the same inquiry concerning cog wheels.—G. D. Answer: Power cannot be obtained by a lever at all. There is no contrivance by which power can be augmented. You raise a greater weight by a lever, but you raise it through a shorter distance; the mechanical force in foot pounds is the same at both ends of the lever. The weight that can be raised at the short end of the lever by that applied at the long end varies with the position of the fulcrum, or, in other words, inversely as the proportion of the two parts of the lever; and the distance through which the weight is raised varies directly as the said proportion. Both levers and cog or gear wheels transmit the number of foot pounds that you apply to them, less the friction. If by a lever you raise double the weight, you may know that you raise it half the distance, that is, that it will take twice the time to raise it the whole distance. The proportions of the efficients of cog wheels may be found by counting the teeth.—J. T. N., of N. Y.

EXTERMINATING SNAILS.—To J. A. D., query 15, page 217.—Cement the well from the platform to the water, plastering it like the wall of a house, using the common brown cement, with about one third sand.—J. W. N., of N. J.

SAW MILL HANDS.—To G. V. V., query 5, page 202.—The chief reason why saw mill owners cannot get men is because they will not pay over $40 a month wages. Men who can run a mill perfectly can be had by paying them wages.—A. M., of Mo.

DISSOLVING SHELLAC.—To L. Q. B., query 8, page 217.—To an ounce of shellac in a gill of water, add a piece of borax about the size of a small hickory nut; let it simmer but not boil, and stir it gently until dissolved. After it has cooled, add water if too thick.—T. A. A., of Mass.

SAPONIFICATION OF LINSEED OIL.—To J. D. E., query 2, page 202.—If the linseed oil in the woolen cloth has become dry, you will have great difficulty in removing it by saponification with an alkali. If the cloth is valuable, probably the best plan will be to soak it in benzine and so dissolve the varnish; you can then thoroughly wash it with soap and water.—E. H. H., of Mass.

BURNING GAS.—To M., query 6, page 217.—The more light from the argand burner is probably due to a better combustion of the gas. According to a report to the London Board of Trade (SCIENTIFIC AMERICAN, Vol. XXV., page 369), if the illuminating power of a Sugg's argand No. 1 be taken as 100, that of the ordinary burners would range all the way from 73 to 19; the pressure of the gas was of course the same in each test, each burner using 5 feet of gas per hour. This, I think, proves that the best (for there is a difference) argand is the cheapest of burners.—P. B. T., of N. Y.

SAW MILL HANDS.—To G. V. V, query 5, page 202.—Yes; the circular saw is a difficult tool to handle, and this accounts for the incompetency of the men and failures of mill owners. The carriage ways must be level and in perfect line, and the saw lined a little into the sag. The saw, being properly hung, and the head blocks running level and true, will do good work, when the saw is properly dressed. The set of the teeth should be alike on both sides, each one cutting the same depth of chip. If you want a good saw operator, let us see your advertisement for references.—J. P. A., of Ill.

BOILER SCALE.—Let E., query 10, page 216, make a mixture of sal soda, 40 lbs., gum catechu, 5 lbs., and sal ammoniac, 5 lbs. Put one pound of the mixture for each barrel of water into the tank. If he perseveres in this treatment, he will find his scale will be removed. After the scale is once removed, sal soda alone will keep it perfectly free from deposit of any kind. I have used sal soda for several years, and find it works charmingly. My boiler was second hand when our firm bought it, and the scale was more than an eighth of an inch thick. By the use of 10 lbs. of soda a week, I have succeeded in getting it as clean as if it had not been used a day. The boiler is as clean of scale as if new. My boiler is 26 feet long by 40 inches diameter. E. can use his judgment as to how much soda to use for his boiler; I give him the amount used for a boiler of that size. After he has tried this, I should like to hear the result.—A. H. G., of Mo.

SLIP OF LOCOMOTIVE DRIVE WHEELS.—To C. T., query 11, page 234.—The crank pin when at its lowest point is stationary, and no power is developed at this point, as there is no motion; but the pin, through the connecting rod, piston rod and piston, forms a stationary abutment for the steam to rest against while the power is being developed against the forward cylinder head, sliding the cylinder along over the piston and carrying with it the engine to which it is bolted. While the sliding cylinder is slowly nearing the end of its stroke, and the piston as slowly begins to move on the return stroke, the crank pin makes a rapid and wide change of position to the upper part of wheel; a change in the development of the power now takes place, for now the piston itself becomes the moving mass, dashing along at a speed much greater than the moving train, carrying with it, through its connections, the crank pin. The wheel, being merely a circular lever with its pivot constantly at the point of contact with the rail, pushes the axle in the center forward against the box and frame, thus propelling the engine, and so on, alternately pushing the train by the cylinder bolts, and by the jaws of the axle box. The power for slipping wheels or propelling engine is the same in both movements, except that there may be an excess of friction against the forward part of axle box when the piston is the mover.—G. E. F., of N. H.

GRAVITY.—J. W. T. attempts, on page 250, to answer the query 20, page 153: "Do bodies weigh more at the poles than at the equator." He says "at the level of the sea there can be no difference between the weight of bodies at the equator and at the poles. If there were, the water of the ocean would sink where it was heaviest and rise where it was lightest, till the equilibrium would be restored and the weight would be the same." He furtner says "this is what has taken place, for the centrifugal force due to the earth's rotation has enlarged its equatorial at the expense of the polar diameter." Now, his reasoning "If there were, etc.," would be correct if the earth were not rotating, in which case it would have assumed a globular form in consequence of the molecular attraction, on the same principle on which melted metal, that hardens while falling through the air (in which case its particles are free to shift), forms globular shots. But the earth is rotating, as he himself admits. By this rotation a new force, the centrifugal force, diminishing from the equator towards the poles, is generated, which would disturb or has disturbed the globular equilibrium. As he denies greater weight of bodies near the poles, he proves by his reasoning "if there were," etc., that there was no sinking in of the poles, which is contrary to the fact. In saying "this is what has taken place," etc., he admits the sinking in of the poles, in consequence of the rotation of the earth, which is correct. Now, if the result arrived at by a supposition is contrary to the facts, it is obvious that the supposition was wrong. So J. W. T. has erred twice, in adopting a wrong supposition and in contradicting himself.—E. W., of N. Y.

Communications Received.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a New Fungus. With a Stereo-picture.—By G. B. L.

Thermometrical Observations.—By J. P. B.

On the Duration of Time from the Creation to the Present Year.—By H. E. G.

On the Effects of Lightning upon Trees.—By F. H.

On the Changing of Pay Day.—By W. B. D.

On the August Meteoric Shower.—By J. H.

On the Condition of Matter which Constitutes a Vacuum in Electricity.—By D.

On the Dangers of Car Coupling.—By D. M. S.

On Burial Customs in Bavaria.—By R. C. J.

On Science and Religion.—By R. W.

On a New Form of Propeller for Canal Navigation.—By A.T.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

LARD COOLER.—George Carleton Cassard, Baltimore, Md.—The invention relates to that special class of machines in which melted lard is received and stirred continuously until cooled by the application of air, water, or other medium. The invention consists in immersing at intervals, within the lard receptacle, one or more hollow cylinders, or sections of cylinders, in which are placed cooling fluids, or other heat absorbents. It also consists in forming the scrapers, which are employed to prevent adhesion of the lard to the cylinders, of straight vertical slats and straight springs. It also consists in combining the lard outlet valve with a rod passing through but not in contact with the rotary shaft of the machine, and operating it by means of a lever located on top of the machine.

OIL CAN.—Joshua Robinson, Baltimore, Md.—The invention consists in providing the neck of a can with an electric spout or lip held thereto by an inwardly pressing spring, and also with an air chamber having apertures which facilitate the outlet of oil.

WHEEL PLOW.—William Mason, Monmouth, Oregon.—This invention has for its object to furnish an improved sulky plow. The axle is bent twice at right angles, or made with a short offset or shoulder at the land side of the frame, so that the said frame may be level while one wheel is running in the furrow and the other upon the unplowed land. The said frame is supported by and pivoted to the said axle. The forward ends of the beams of the frame are attached to the opposite sides of the rear end of the tongue.

The plow beam is placed between the beams, and through the rear end of all three the axle passes. To a U shaped bracket, the ends of the arms of which are attached to the beams so that the plow beam may move up and down within said bracket, is pivoted a lever, the rear end of which extends back into such a position that it may be conveniently reached and operated by the driver from his seat, and which may have a foot rest or stirrup attached to it to enable the driver to operate it easily to receive the bolt The forward end of this lever has a bolt or other support attached to the by which it is and plow beam, so that the plow may be raised from the ground or adjusted to work at any desired depth in the ground by simply operating the said lever. A standard passes down through the rear part of the tongue, and to its lower end is pivoted a caster wheel, which supports the forward part of the machine. The lever is operated to raise and lower the plow beam and plow, while another lever is also operated to move the forward end of the frame in the same direction, thus increasing the effect.

WASH BOILER.—Jacob Davis, Florida, Mass.—This invention has for its object to furnish an improved washer for washing cloth, clothes, bedding, etc., quickly and thoroughly, without wearing the cloth, straining the seams, or injuring them in any way. As the heat is applied, the boiling suds and steam pass up through the flues and are discharged through holes upon the clothes in the interior of the boiler, through which they pass to a slot, and back into the flues, thus keeping up a continuous circulation, cleaning the clothes thoroughly in a very short time.

DIAMOND SETTING.—Ferdinand J. Herpers, Newark, N. J.—This invention relates to a new setting for diamonds or other precious stones or imitations thereof, though more particularly intended for pure diamonds, with the object of obtaining a better display of the beauties of the stone. The invention consists in constructing the setting of a series of arms or prongs that radiate from a common center, thus exhibiting the jewel in all its beauty.

CULTIVATOR.—Calvin D. Perkins, Princeville, Ill.—This invention has for its object to furnish an improved cultivator designed especially for garden use as a hand machine, which may be adjusted to work at any desired depth in the ground, and also to throw the soil more or less toward the plants, as may be desired. The cutters are bent at right angles so that the blades may work in a horizontal position a little below the surface of the ground to cut off the roots of grass, weeds, runners, or other vegetation that may be growing between the rows of plants. The cutting blades may be adjusted to work at right angles, or at any other angle, with the line of draft, as may be desired. Upon the rims of the drive wheels are formed, or to them are attached, ring flanges or cutters to cut off runners that may be thrown out from the rows or hills of plants, such as strawberries, and thus prevent the said plants from spreading. The machine is light and graceful in appearance, and such a digression from the ordinary cultivator that it will likely come into general use.

BALING PRESS.—Joseph P. Taylor, Hudson city, N. J.—This invention has for its object to improve the construction of the baling press described in letters patent No. 70,649, granted to Joseph P. Taylor and Jackson R. Baker, November 5, 1867. To the side parts of the foundation frame of the press, upon the outer sides of the baling box, are attached two side frames. Yokes are pivoted to the outer sides of the baling box or to supports connected with the side frames. Upon the opposite or diagonal corners of the under side of the yokes are formed projections or cams, having smooth inclined faces against which the ends of the levers rest. To the outer sides of the yokes are attached other levers, the outer ends of which, at each end of the press, are connected by a cross bar, and serve as handles in operating the press. The levers first mentioned are bent into U shape to pass around the ends of the baling box, and their ends or long arms project along the sides of said baling box, overlapping each other. The ends of the levers project upward so that they may pass beneath the yokes and operate upon cams or projections furthest from the pivoting points of said levers. The levers are pivoted to the sides of the baling box near its ends. To the center of the middle parts of the levers that cross the ends of the baling box are pivoted the lifting pawls, which are so formed and pivoted that their own weight will hold them forward against the teeth of the rack bars upon which they operate. The holding pawls are pivoted to the end posts of the press or to the baling box frame, and are so formed and pivoted that their own weight may hold them forward against the teeth of the rack bars to hold the said rack bars in place while the lifting pawls are moved down to take another hold. The lower ends of the rack bars are pivoted to the ends of the follower, so that the said rack bars may retain their vertical positions however much the follower may incline, as its ends are alternately raised by the action of the levers and pawls. The follower is grooved for convenience in passing the bands around the bales and moves up and down through the vertical baling box. Doors, which form the sides of the upper part of the baling box, are hinged at their lower edges to the frame The lower edges of the doors project a little below the bars to which the hinges are attached, said projecting edges entering recesses formed for their reception at the inner edges of the frame to relieve the hinges from the strain. The upper parts of the doors are secured in place by the bars which extend entirely across the ends of the baling box, and which have hooks or catches formed upon their ends to hook or catch upon the ends of other bars which extend longitudinally across the upper parts of the said doors. By this construction the hook or catch bars and the bars form a band or frame surrounding the baling box. The cover of the baling box is made heavy so that, as it is allowed to drop, it may force the material placed in the box downward, packing it more closely into said box; said cover is held down and secured in place by lock bars, which are pivoted at one end to the side part of the ends of the cover, so that they may be swung into grooves in the inner sides of the end posts. Cords, the ends of which are attached to the end parts of the cover, pass over pulleys pivoted to the upper ends of the end posts. To the cords are attached hooks which, when the cover is raised, may be hooked into hooks or eyes formed upon the upper ends of the rack bars to hold the said cover securely while the baling box is being filled. The operating parts of the press are all located upon the outside of the baling box, so as to allow the baling box to be close down to the foundation frame, enabling the press to be made much lower and making it much more convenient than the old press.

[OFFICIAL.]

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SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

2,460.—MANUFACTURE OF STARCH.—S. T. Stratton. Dec. 11, 1872.
2,500.—BEE HIVE.—J. S. Harbison. Dec. 18, 1872.
22,503.—OPERATING VALVES OF PUMPS.—L. J. Knowles. Dec. 18, 1872.
22,514.—SIFTING SHOVEL.—P. A. Sabbaton. Dec. 18, 1872.

EXTENSIONS GRANTED.

21,659.—FOLDING GUIDE.—A. Douglas.
21,698.—HORSE RAKE.—M. Raezer.
21,712.—HORSE RAKE.—G. Whitcomb.
21,712.—HORSE RAKE.—G. Whitcomb.

DESIGNS PATENTED.

6,149.—TOY STEAM ENGINE.—G. A. Brown, Farmington, Mich.
6,150.—STOVE.—E. S. Heath, Baltimore, Md.
6,151.—COOKEYE.—J. Letchworth, Buffalo, N. Y.
6,152.—COOKEYE.—J. Letchworth, Buffalo, N. Y.
6,153.—LAST.—G. D. Melotte, Utica, N. Y.
6,154.—HAIR NET.—G. Osborne, Brooklyn, N. Y.
6,155.—COOKING RANGE.—W. A. Spicer, Providence, R. I.
6,156.—TOY BANK.—D. A. Stiles, Durham, Conn.
6,157.—SHAWL.—F. Wink, Philadelphia, Pa.

TRADE MARKS REGISTERED.

1,000.—SEWING SILK, ETC.—Brainerd, Armstrong & Co., New York city.
1,001.—LAMP BURNERS.—Bristol Brass and Clock Company, Bristol, Conn
1,002.—WHISKY.—J. E. Cassidy, Boston, Mass.
1,003.—FRICTION MATCHES.—J. L. Clark, Oshkosh, Wis.
1,004.—CUTLERY, ETC.—W. Clauberg, Solingen, Prussia.
1,005.—LEAD PENCILS.—Cutter, Tower & Co., Boston, Mass.
1,006.—FLOUR.—Empire Mill Company, St. Louis, Mo.
1,007.—PAINTS.—Maxwell & Clarke, Brooklyn, N. Y.
1,008.—CORSETS.—Ottenheimer, Rothschild & Co., New York city?
1,009.—PLOW.—Springfield Iron Works, Springfield, Mo

COPIES OF PATENTS.

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Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

Address Munn & Co., Patent Solicitors, 37 Park Row, New York city.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants or their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co., 37 Park Row, for full particulars.

Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row, New York.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Canadian Patents.

On the 1st of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with Munn & Co., 37 Park Row, N. Y., who will give prompt attention to the business and furnish full instruction.

European Patents.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels, and other chief cities. A pamphlet, pertaining to foreign patents and the cost of procuring patents in all countries, sent free.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an honest opinion. For such consultations, opinions and advice, *no charge is made.* Write plain; do not use pencil, nor pale ink: be brief.

All business committed to our care, and all consultations, are kept *secret and strictly confidential.*

In all matters pertaining to patents, such as conducting interferences, procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

Address

MUNN & CO.,
PUBLISHERS SCIENTIFIC AMERICAN,
37 Park Row, New York.

OFFICE IN WASHINGTON—Corner F and 7th streets, opposite Patent Office.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From September 17 to September 25, 1872, inclusive.

AIR ENGINE.—C. P. Leavitt, New York city.
BUTTON HOLE SEWING MACHINES.—A. L. Wood, Boston, Mass.
CHEMICAL PROCESS.—C. Morfit (of Baltimore, Md.), London, England.
DRIVING SEWING MACHINES.—R. Whitehill, New York city.
HARDENING BRICK AND STONE.—G. H. Smith (of N.Y. city), London, Eng.
HEMMER, ETC.—P. Grosfeld, W. A. Bennett, A. B. Carman, New York city.
RAILWAY WHEELS, ETC.—J. K. Sax (of Pittston, Pa.), London, England.
RAKE FOR REAPING MACHINE.—L. B. Bruen, New York city.
ROLLING SCREWS, ETC.—R. Boeklen, Brooklyn, N. Y.
SEWING MACHINE.—W. S. Lincoln, W. A. Rayer, Boston, Mass.
TELEGRAPH WIRE.—C. J. A. Dick, Pittsburgh, Pa., and G. A. Dick, London, England.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO. 37 Park Row, N. Y.